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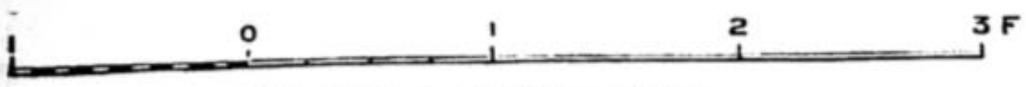

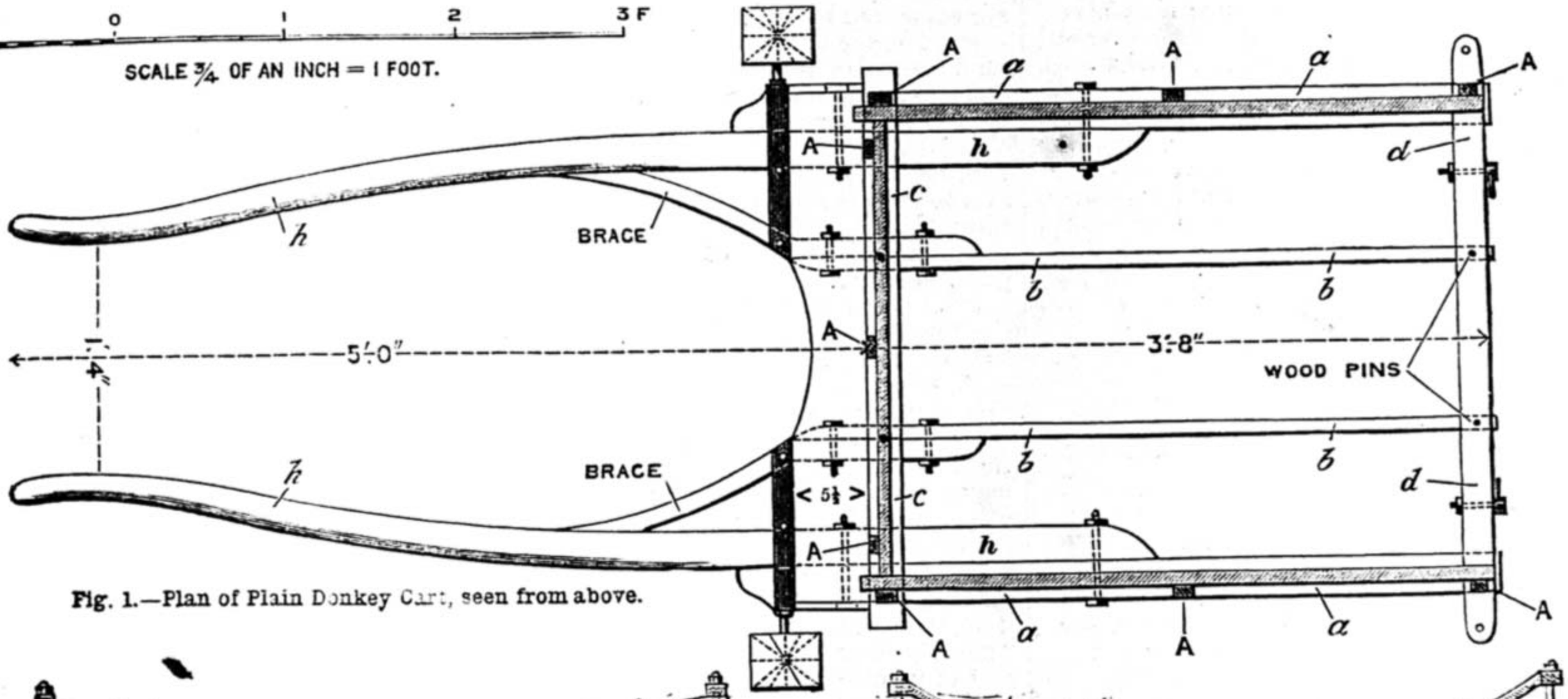

Fig. 1.—Plan of Plain Donkey Cart, seen from above.

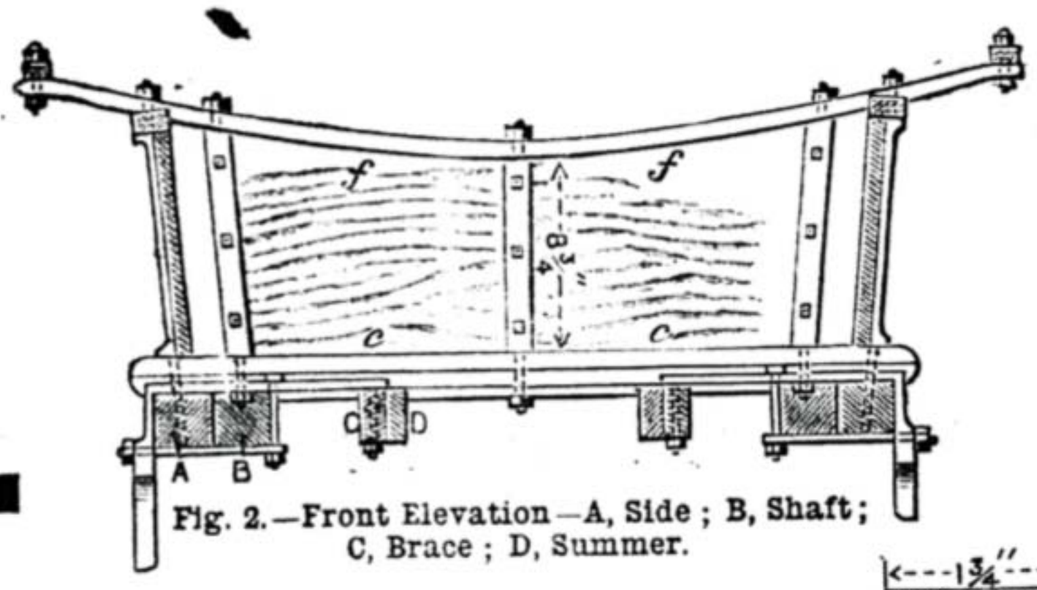

Fig. 2.—Front Elevation—A, Side; B, Shaft; C, Brace; D, Summer.

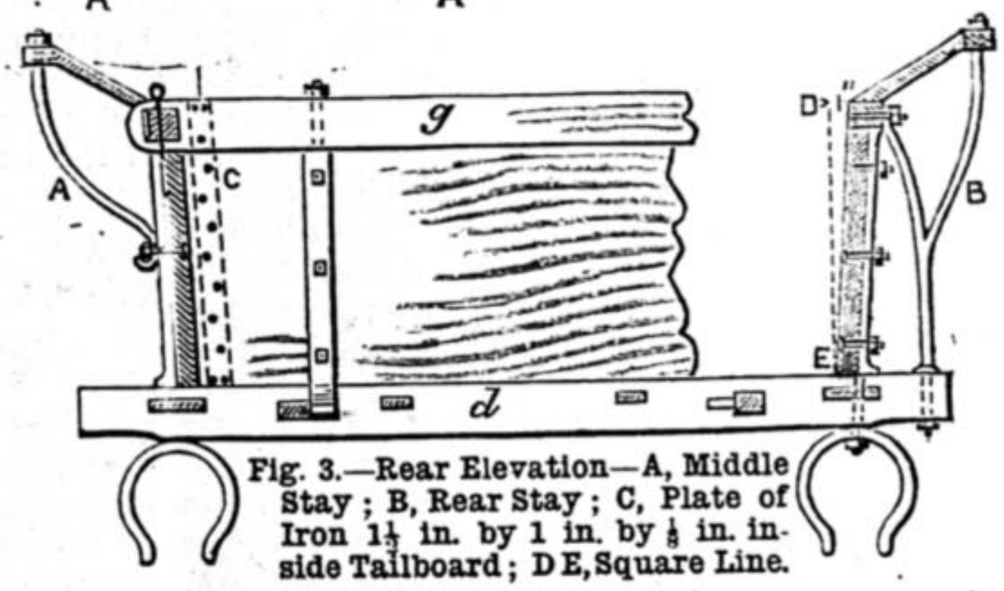

Fig. 3.—Rear Elevation—A, Middle Stay; B, Rear Stay; C, Plate of Iron 1½ in. by 1 in. by ⅛ in. inside Tailboard; D E, Square Line.

Fig. 6.—Enlarged Sketch of Standard.

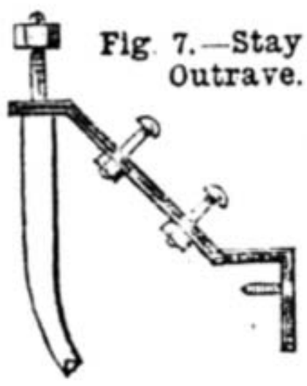

Fig. 7.—Stay for Outrave.

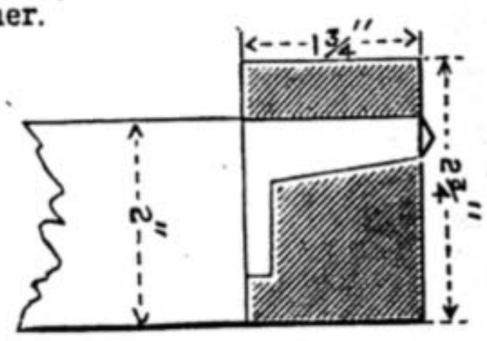

Fig. 5.—Mortice and Tenon of Hind Earbed.

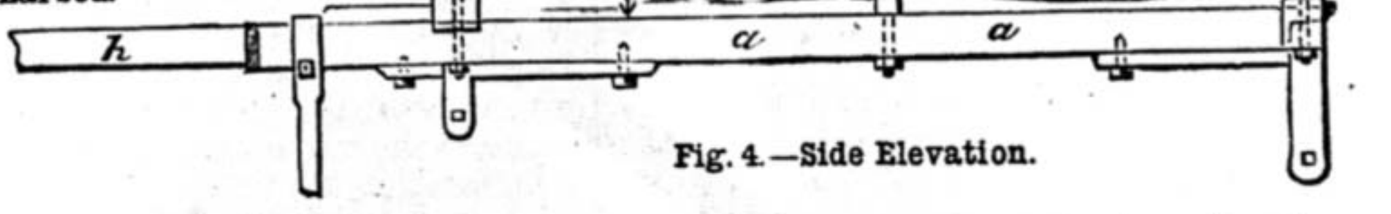

Fig. 4.—Side Elevation.

A PLAIN DONKEY CART.

BY J. P. S.

I MAY best commence by saying that this paper is the outcome of a question asked by a correspondent. As it would take about half the space devoted to "Shop," it seems to me that I may best render assistance to those who are interested in the matter by giving a description of the cart with the necessary diagrams, on a scale of ¾ in. to the foot.

The plainest and cheapest kind of carts for rough and heavy work are what is known as "plank sided," *i.e.*, made of stout planks on edge, instead of a frame of hard wood lined with thin boards. I think I can best serve the readers of WORK by giving particulars of a donkey cart I made early in the year 1887 for a young fellow who had but little money to lay out, and who told me very recently it suited his purpose admirably. He uses it to fetch firewood, and to take linen to and from a laundry, etc. He wished it to be full size, as he hopes to rise to a pony. I advised him to buy a good pair of second-hand wheels and axle complete off a four-wheel cab. He did so for 25s., and bought them well worth the money; if you follow his example, buy them in the rough, not a pair that has been "doctored" and painted over. I give the dimensions below, in case any intending builder of a cart may prefer to buy new wheels and axle. You may get all you require from Mr. Callow, Pembroke Street, N., near the Great Northern Railway potato market; or from Gadsdon's, 11, Brushfield Street, Bishopsgate, E., amongst many others. The

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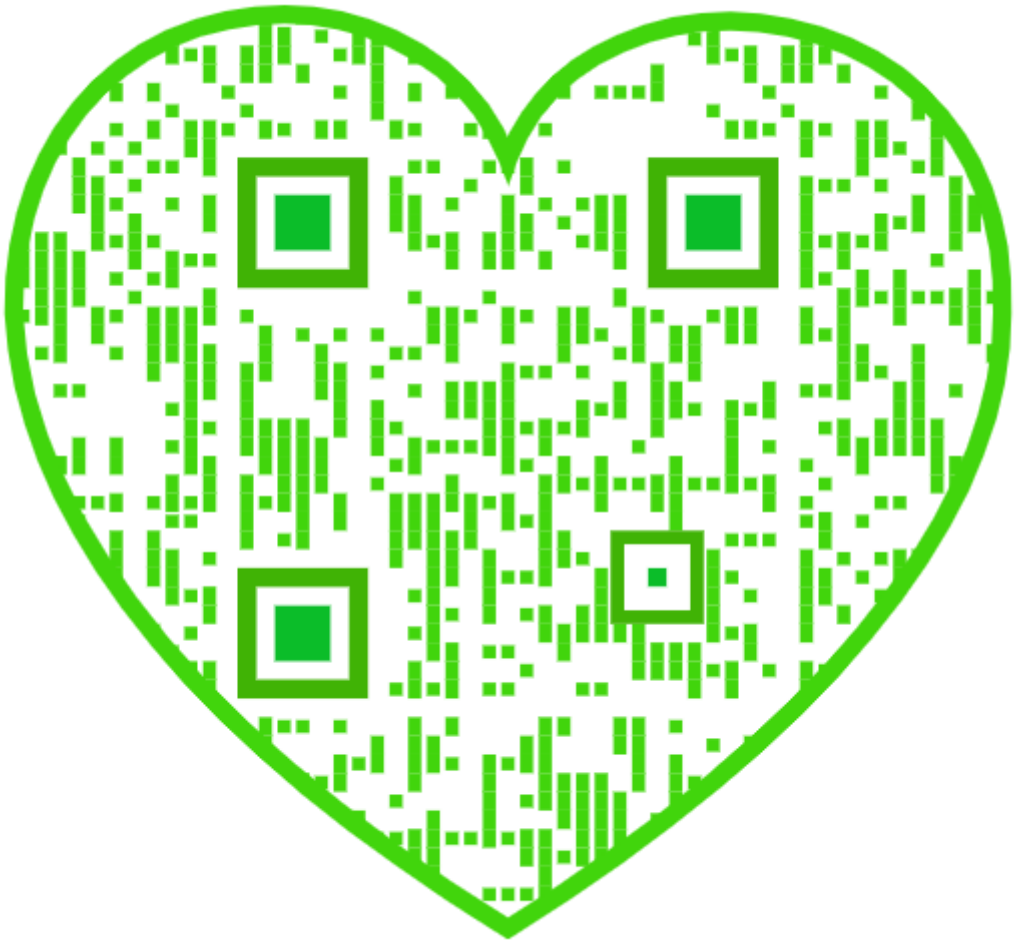

rough sketches of the plan as seen from above. the front elevation, rear elevation, and side elevation in Figs. 1, 2, 3, 4, will give a good idea of the style of cart I recommend. The shafts, sides, raves, summers, front and hind earbeds, should all be of clean dry ash. The panels and footboard are of elm, also dry, and ¾ in. thick when finished. The bottom boards of the body may be of yellow deal ¾ in. thick. Here are some dimensions—wheels, 3 ft. 8 in. high; hubs, 7 in. diameter, 8½ in. long; felloes, 2½ in. square; tyres, 1⅝ in. by ½ in.; axle, 1½ in.; solid flaps on which to fix the springs are preferable. Get what is known as a *nut* axle. Springs, 3 ft. 6 in. long; six plates 2 in. steel; four clip staples 4 in. long over all; front scrolls, "cheek" pattern; hind scrolls, "globe" pattern; they are stronger, and will not come in the way of the tailboard when let down; one or two footsteps, according to capacity of pocket, and shaft irons to fit the kind of harness to be used. This will be about all the ironwork that can be bought ready made; the remainder must be made to order either where the springs are purchased or by a local smith. The dimensions of wood are—

		Length.	*Depth.*	*Width.*
Two sides	(*a*)	4 ft. 4½ in.	2 in.	2½ in.
Two summers	(*b*)	4 .. 1 ..	2 ..	1¼ ..
One front earbed	(*c*)	3 .. 5 ..	2 ..	2¼ ..
One hind ..	(*d*)	3 .. 7 ..	2 ..	1⅝ ..
Four side raves	(*e*)	4 .. 2 ..	1 ..	1½ ..
One bent front rave	(*f*)	4 .. 2 ..	1 ..	1½ ..
One tailboard ..	(*g*)	3 .. 4 ..	2½ ..	1½ ..
Two shafts	(*h*)	7 .. 0 ..	2 ..	2¼ ..

The shafts are tapered from the footstep forward from 2 in. to 1⅝ in. in depth, and in width from 2¼ to 1⅝ in., and all the dimensions are finished sizes and lengths, consequently your stuff should be at least 2 in. longer when in the rough. You will also require two wood braces for the shafts, of which you should make a template and get them sawn out to it.

To construct, commence by planing up true, and framing out the bottom by morticing on the hind earbed; a sketch of the mortice and tenon is given in Fig. 5; these are the only four mortices in the cart, if we except the top rave of the tailboard. Observe the earbed is ¾ in. higher than the sides to allow the bottom boards to be flush with it when laid. The front earbed is notched down ½ in. to keep the four pieces in their places. Do not allow the frame to get out of square, nor the stools to "wind" on which it is laid, or the cart will be the subject of many a joke when finished. Next in order will be required nine iron standards to bolt the panels to, and also to carry the raves in lieu of several wood standards. Carts made of 1½ in. planks are held together with long ½ in. bolts instead of these iron standards, but these not only allow of thinner panels, but are easier of construction, and also far more simple to repair. An enlarged sketch of one end of these standards is given in Fig. 6; the screwed ends are ⅜ in. at bottom and $\frac{5}{16}$ in. at top in all cases; the lengths vary, as reference to the sketches will show: thus the four corner ones must be long enough to take the four scroll irons for the springs. These standards have large shoulders both top and bottom, and each have three holes drilled in them to take ¼ in. countersunk bolts with which to fasten in the panels. Having procured these nine standards, proceed to fix them as indicated at A in sketch plan (Fig. 1). Observe the panels are "set on" ¾ in. from face of framework. The side panels splay 1 in. outwards (see rear elevation, Fig. 3), the front 1½ in. forwards, and the tailboard 1 in. backwards. The side panels are 12½ in. deep. The two side raves and the front rave are next fitted on the top ends of the standards: the panels are fitted in, the raves and panels coming "flush" on the inside. The remainder is fairly plain sailing. The footboard is 5½ in. wide, and hollowed out to give more room to the animal's hocks. The top rave of the tailboard is deep to allow of the mortices in the ends to pin it on to the raves; two plates of iron 1 in. by ⅛ in. are fastened with screws inside the ends of the tailboard to strengthen it. A couple of hooks and chains to suspend it and to lengthen out the carrying capacity of the body may be added. The outraves are supported by four middle stays and two rear ditto, the latter also strengthening the hind corners of the body. I have cut away a portion of the tailboard in sketch to show this. The outraves are boarded with yellow deal ¾ in. thick; four stays of coach hooping 1 in. by ⅛ in. are fixed on each side as shown at B to keep the outraves in position, and to these this board is fastened by small bolts. An enlarged sketch of one of these stays is given in Fig. 7.

If there is only one footstep, the near shaft will require three bolts instead of two to keep it rigid. Do not fasten the footstep with a bolt *through* the shaft, but down the side of it. Set the centre of the axle ½ in. behind the centre of the cart body, and fix the left-hand nut on the near side. You may add a plate of iron under the front end of each shaft 2 ft. long. If you care to scollop the woodwork, do so to your heart's content; I have shown none, not wishing to crowd the sketch. Paint the body dark blue, and line it light blue, the wheels, springs, and axle, "mail" red, and line it dark blue; give it a coat of varnish and plenty of water.

If anything is not plain to any reader, let him ask for advice in "Shop." It is just what the Editor likes.

HINTS ON REPAIRING FURNITURE.

BY KENELM POOLEY.

It occasionally happens that there is an old piece of furniture which, though shabby and somewhat dilapidated, is yet sufficiently sound to be useful. Its appearance is the principal objection, but a little judicious "touching up" may make it, if not as good as new to look at, at least so good that it is not unsightly. Of course if it is a valuable article, and expenditure of money is of secondary importance, the best way is to get the work done by an experienced cabinet maker, but it may fairly be assumed that there are many readers of this Magazine who would prefer to do the work themselves if they only knew how to go about it. For the benefit of such, these few hints are given. No pretence is made that they exhaust the subject, for it is practically inexhaustible. No two articles require exactly the same treatment, and the fitter must just rely on his own judgment to a great extent.

There are, however, some defects which are common to most pieces of furniture which have been used—and very likely also misused—and the general course of treatment of such may be indicated.

It may be taken for granted that the polishing will require attention. Possibly it only requires cleaning, but on the other hand it may be necessary, owing to defects in the way of bruises or scratches, or in the case of veneered work, where there are blisters, to repolish entirely. Let it here be understood that though the remarks apply more or less to all kinds of cabinet work, they have special reference to carcase work, such as chests of drawers, sideboards, wardrobes, etc., in any of the better kinds of furniture woods.

If the polish principally requires cleaning, there is no better preparation than the one which has been frequently recommended in "Shop." As its components are French polish, vinegar, and linseed oil, there is nothing to injure any polished woodwork to which it is applied, while it not only acts as a cleanser, but as a reviver. A soft rag has merely to be moistened with the mixture and rubbed on, giving a final wipe with a clean dry soft cloth if necessary.

In the next stage of badness it may be desirable to touch up with French polish. This is necessary when the original polish has perished, and the deficiency must be supplied by some more being added. The old polish is not got rid of, but serves as a groundwork of body for what is laid on it. It is, in fact, just to be gone over with a rubber moistened with French polish in the ordinary way. Naturally, some skill in the use of the rubber will be required, as in any other polishing work, the main difference between polishing new things and touching up old being, that with the latter, the preliminary operations of oiling, filling in, and bodying up do not have to be done again.

It often happens that it is desired to entirely repolish work. In this case, the old polish should, as far as practicable, be removed. No difficulty will occur with flat surfaces, but where there is much intricate carving or small mouldings, it is not always an easy matter to clean away the old polish. It may be washed off with soda, potash, and other similar substances dissolved in water, but those inexperienced in such work are advised to use them with care or they may find that they have altered the colour of the wood. It is certainly safer when practicable to rely as much as possible on mechanical means. These, of course, take the shape of scrapers and glass-paper. Occasionally it may be considered advisable to run the plane over the work, but this can obviously only be done on plain, flat surfaces. To those unaccustomed to the scraper, it may be worth while to suggest that a great deal can be accomplished with it alone. The amount of shavings which it will make when properly manipulated may astonish them.

While the scraper is doing its work, scratches, dents, and bruises will become more conspicuous from the contrast between them and the comparatively light wood where the polish has been removed. It must be for the worker to decide to what extent he will scrape down to remove these defects. One thing he must be careful about, and that is—the surface must be kept as level as possible. It will not do to rub down with paper where there is some particularly deep or objectionable scratch or dent, without removing the surface from the rest of the work to the same extent. The slight hollow caused by papering down locally might not be noticeable to any great extent while the wood is unpolished, but when polished it probably would be.

To repolish, proceed as if the work were new, but if a very little of the surface has been removed, it may not be necessary to use any filling. Of course, if every trace of the old polishing has been removed, the wood is for polishing purposes practically new, and must be treated as such.

Bruises may sometimes be removed by merely moistening them. The action is that the water, or rather dampness, swells the bruised

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fibres of the wood, and causes them to rise to their original position. This treatment cannot always be depended on as being efficacious; but there can never be any harm in trying it. Of course, if the polish prevents the moisture getting into the wood, no good can result.

Scratches, cuts, or cracks cannot be remedied by this means. If the two former defects are slight, the scraper may be relied on to remove them, but if very deep and serious they may be filled up with stopping. Cracks, if small, may be dealt with in the same way, but if large it will be better to splinter them up with thin wood. A piece of veneer or wood of suitable thickness should be taken, and after being glued on both sides, forced edge downwards into the crack as far as may be necessary. Do not trim off the upper edges of the splinters till the glue has set. If properly done, the inserted piece will scarcely be distinguishable.

Blisters occur on veneered work. As a rule, they can easily be recognised, but to lay them much care is often necessary. Some may not understand the meaning of blisters as applied to woodwork. It may, therefore, be explained that they are caused by the veneer in places not being glued down to the solid groundwork. This will partly indicate the remedy: it is simply that the veneer must be glued down where it is blistered, or, in technical language, the blisters must be laid. If the glue under the blisters has not perished, it may sometimes be made adhesive by moistening it. How this may best be done depends almost entirely on circumstances. The great matter is to get the moisture to reach the glue without unduly affecting the wood. The blister may be pricked or even cut—of course in such a way that it is not permanently marked. Through the cut a little water must be got under the veneer. Heat and pressure must be used to cause adhesion. They may be applied with a warm hammer-head or anything handy—if necessary, using a small caul and handscrews.

It very frequently, however, happens that there is no glue remaining under the blister. In this case, new glue must be inserted, and the adhesion be kept up as before till the glue has set. Sometimes the veneer is chipped away, and must be replaced by new pieces. To do this properly requires some degree of skill and the exercise of discretion, without which, indeed, it is almost hopeless to expect to do any repairing work well. The colour of the new pieces must be as carefully matched as possible to that of the old, and attention must be paid to the configuration of the veneer in which they are to be inserted. Much may often be managed by cutting away some of the old veneer in order to get a sightly joint. To manage this part of the work properly requires neatness as much as anything.

With these few hints, this article must close in the hope that it may be helpful to many who, though not able to make anything in the way of furniture from the plank, are yet able to do a bit of tinkering. If any reader is disappointed that the repairing to which this paper is devoted deals with the renovation of veneer and improvement or renewal of the polish, and does not go into repairs of actual damage, let me point out that every fracture, or nearly so, requires the peculiar mode of treatment best suited to it. To do this, I should be compelled to deal with hypothetical cases. This would involve too many papers, so I must answer queries regarding breakages specially in "Shop."

THE MECHANICAL PROCESSES OF SCULPTURE.

BY MARK MALLETT.

Piece and Elastic Moulding, with other Wrinkles in Plaster Work.

Piece Moulding from Plaster, Marble, etc.—Elastic Moulds—Clay Squeezes—Mending and Cleaning Casts—Painting, Gilding, Silvering, and Bronzing on Plaster.

In those papers on plaster casting which have hitherto appeared in WORK, we have dealt only with waste moulds—moulds, that is, in which one cast only can be made, and which are destroyed to liberate it; and this is by far the most interesting and important branch of our subject.

Much less space will need to be given to methods of casting by moulds from which an indefinite number of casts may be produced. Such moulds are not like waste moulds taken from soft and yielding substances like clay, but from hard ones, such as marble, metal, and more especially from plaster. If we wish to multiply casts from a model which we have formed in clay, we must first make a single cast by means of a waste mould, and from that a piece mould, or perhaps, in some cases, an elastic mould. It is in piece moulds that the plaster images sold in shops and by wandering Italians are almost exclusively made.

Piece moulding, so far as regards the making of the actual mould, is a tedious operation, and the person who sets about it will need patience and neatness of hand. A piece mould is so called because it necessarily consists of a number of pieces; and every one of these is so arranged that it will "leave" the cast without difficulty. It is, therefore, generally necessary that the pieces should be numerous and sometimes very small; to mould a face, a dozen or more pieces will probably be required.

Before beginning a piece mould from an object in plaster, it will be well to rub hog's lard over the surface, to prevent sticking. This kind of grease is preferred, as being colourless. The first piece of the mould is made in a central position, the moulder making no wall of clay or otherwise round it, but merely building the stiffening plaster with his spatula. He takes care to extend this and every future piece no farther than that it will be able to "leave" without obstruction. When this first piece is set, he removes it, trims its edges with a knife, greases them, and replaces it. Then he builds up two more pieces against it on its opposite sides, and treats them as he did the first piece; and so he goes on till the whole bust, or piece of ornament, or whatever the object in plaster may be, has been covered with pieces. Sometimes these pieces will stick rather tightly to the plaster object, and gentle and careful tapping will be needed to bring them away unbroken.

These form an inner mould, and have next to be covered with an outer one, forming a shell to enclose the whole. In a relief this shell will probably be in a single piece; in moulding from the round it will be in two, or perhaps more, pieces; the shell of a bust will be in two. When the pieces of the inner mould are put together for filling, and enclosed in the shell, which is bound tightly round them, they fit together with such accuracy as to seem almost like one solid mass.

In such a mould as this a very thin crust of plaster suffices to form a cast, for it will have to bear none of the hard knocks by which a waste mould is removed. A piece mould will serve to produce an almost unlimited number of casts. It will, however, gradually suffer from wear. In the earlier casts a faint raised line will show where the different pieces join. These joining lines should, to make a cast look well, be cleaned away. As the mould is used, these lines will grow wider and more unsightly.

When the piece mould is to be taken from marble, no grease should be used on that delicate material; white curd soap is then the proper thing to prevent sticking. This washes off, and leaves the surface none the worse.

Elastic moulds are most commonly employed for the reproduction of ornament. Being far more easily and quickly made than piece moulds, they are more in favour with those who take up moulding—not as a calling, but as an interesting pursuit. A mould of this kind, made in one piece and at a single operation, allows any work in relief, of moderate size, to be readily multiplied.

Fig. 31 (page 579) is intended to explain the principle of the elastic mould; it is supposed to be the section of a circular centre ornament. It will be obvious that with under-cuttings such as those at A and B, no mould in a rigid substance such as plaster could be induced to leave in a single piece. But a mould formed in some yielding and elastic substance might be pulled away without being injured, and when removed its elasticity would cause it to resume its first shape.

Various materials have been tried for making moulds on this principle. Gelatine is the favourite. Cheap gelatine, and sometimes glue, are used, but these are not to be recommended. They are apt to soften when the plaster heats in setting, and to break. The following is an approved recipe:—"Best sheet gelatine (say at about 2s. per lb.), 1 lb.; beeswax, ½ oz.; water, ¾ pint. Boil these in a glue-pot till they become a dense syrup."

The object to be moulded has, we will presume, been cast in plaster (say from a waste mould), and a little oil or lard is rubbed over it to prevent sticking; the syrup has to be poured upon it whilst still moderately hot, but *not* boiling.

When the under-cuttings at the edge of the mould are very deep, it is sometimes desirable to slit the mould to enable it to pass over the obstruction more readily. After an elastic mould has been filled, it is pulled from the new cast just as from the original model. Such a mould will serve for a reasonable number of casts, but will not endure like a plaster piece mould.

Clay squeezes ought also to have passing mention before we leave the subject of moulding; for though taking a squeeze is but an imperfect and makeshift process, it affords a quick and ready way of getting a cast of any small work of sculpture in marble, stone, metal, wood, or plaster, where regular moulding might be out of the question; the plan is essentially the same as that employed by a dentist for obtaining a cast of the internal arrangements of a patient's mouth, only while the dentist uses a composition of wax which does not shrink in the cooling, we use clay. Our method is to prepare well-tempered modelling clay, of the consistency of putty, not too hard, or it will not adapt itself readily to the forms with which it comes in contact, and not too soft, or it will stick to them. Say that we wish to possess ourselves of some of the minor details of an ancient building either in stone or wood carving; we make ready a ball of

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clay of the proper size, and press it steadily and directly from the front upon the object. When pulled off it will not indeed give us undercuttings, but it will, if neatly handled, furnish us in other respects with a fairly good mould, from which we can take a cast in plaster. A little knack is needed in taking a squeeze well, and this comes of practice; but anyone can practise with the clay on objects in his own possession.

In a previous article something was said on mending such breakages as occur in casting. Breakages at a later period, when the plaster has become dry, are not quite so easily mended. The fractured edges need to be moderately wetted—not saturated with water—and a little of the plaster scraped away in places so as to allow the newly mixed liquid plaster to run in between the two pieces of the old. If the breakage is a considerable one, say right across the ground of a relief or the limb of a statuette, it is better to let in dowels of copper wire, and to embed them in plaster. By these means the cast may be made as strong as it was before; and, with filling up the crack with new plaster and smoothing it off, all traces of the disaster may be pretty well obliterated, except that in unpainted casts there is a tendency for a faint line of discoloration to appear at a distance from the place—a result of the necessary wetting.

Bare, natural plaster is a bad material to bear exposure. That snowy whiteness which to most people constitutes so much of its beauty soon sullies with dust and dirt, and unfortunately there is no really effectual way of cleaning it. Cleanly housewives, in the innocence of their hearts, sometimes try soap and water, to the utter ruin of the cast. The only known method of cleaning is by sprinkling new dry plaster over the surface, and working it about with a clean soft brush. Most of the discoloration which comes from dust will be taken up by and removed with the dry plaster, but anything of the nature of a stain will remain untouched by it. The only way in which delicate casts are to be kept in their native purity is beneath glass, precautions being taken to exclude air and consequent dust.

To take off the chalky and, in their opinion, raw look of plaster, some persons are fond of saturating casts with such matters as will give them a more soft and translucent look. Many are the matters which have been used for this purpose: among them are white wax, paraffin, skimmed milk, etc. Some skill and care are needed to saturate a cast successfully—with wax, for instance, the cast has to be plunged into the melted wax whilst itself hot. Any ingenious person with leisure might find in this direction a favourable field for making experiments.

The ordinary way of treating the larger casts, such as statues and life-sized busts, is to paint them. For this the cast must first be dry, and the surface will have, before painting, to be satisfied with linseed oil. The paint commonly used is made with best white lead, a little oil, and a much larger proportion of turps than is used in ordinary painting. Some add a little yellow ochre to tone down the white. As a thick coating of paint would tend to choke and hide the modelling, a very thin one only is applied—the painter taking off with a second brush much that he puts on with the first. The painting should be done rather by stippling than by brushing across in the usual way. Casts thus painted can be kept fairly clean; but a new coat of paint is required occasionally.

Gilding, silvering, and bronzing are methods of treating plaster sometimes used, and the latter especially is in favour with sculptors for models of such works as are intended to be eventually cast in real bronze. Gilding and silvering are more used for decorative purposes; but all three appeal to those who find in such like matters interesting pursuits for their leisure. There are persons who make a business of carrying out these processes, and if a solitary cast only has to be treated, it is, perhaps, better to send it to such a person, since in a first attempt no one can expect to be altogether successful. The difficulties are not great.

The cast has first to be satisfied with linseed oil, which should be brushed over it three or four times, with a day's interval between the brushings to allow of drying, and even a longer time should be allowed to pass after the last application. An oil gold size is sold by colourmen, in the form of a paste, like putty, but yellow, from being largely mixed with yellow ochre. This is the best size for gilding on plaster; and if too stiff to work freely, it can be thinned down with linseed oil. It has to be laid smoothly and regularly over the cast. When dry enough to be tacky—say in twenty-four hours, more or less—it is ready to receive the gold leaf, which will best be laid on with a gilder's "tip." The gold has afterwards to be gently pressed down, and superfluous leaf brushed away with a little ball of cotton-wool. Silvering is much the same, only an oil-size without ochre should be used, and the leaf, being thicker and heavier, should be applied whilst the size is somewhat more moist. Both gilding and silvering on plaster are most effective when the surfaces are broad, and much in the same plane, as on flat medallions and other reliefs.

Perhaps that preparation for bronzing which gives the best imitation of the actual metal is of too complicated a nature for any but the professional bronzer, and it would not, therefore, be desirable to occupy space uselessly by giving it here. A more simple way, and perhaps the best for general use, is to apply as a paint the following:—Verditer, Prussian blue, and spruce ochre, varied in quantities according to the hue of bronze required, and ground in oil. Over this, when nearly dry, bronze powder of the hue required is to be dusted on with a bob of cotton-wool. The plaster has, of course, to be satisfied with oil before bronzing.

A DRAWER SUPPORTER.

BY JAMES SCOTT.

I BELIEVE it would be impossible to find a man or woman who has not, at various times in his or her life, been reduced to a state vulgarly known as "out of temper" (which paradoxically means *in* a temper) by being annoyed at the manner in which a drawer would drop when it was opened, and require to be supported by one hand, thus leaving but one hand to turn over the things within, in order to find a particular article. I have a simple contrivance which will, to a certain extent, obviate this nuisance. Its construction will not require advanced skill on the part of my amateur readers. Any existing drawer can have one attached to it, without being injured or defaced in the slightest degree. It is only a pair of flaps.

In the majority of drawers the bottom proper is not flush with the bottom edges of the front and sides of it—there is a space formed by their arrangement. If a thin board is hinged to each side of the drawer, underneath the bottom of it, and within this space, so that it may lay flush with the bottom edges of the sides and front, both boards could be folded flat underneath the drawer, and pushed with the drawer into the carcase; and when the drawer is pulled out to a certain distance, they will fall down at each side, and, by reason of the resistance of the front of the carcase, retain the drawer in a horizontal position.

The size of the flaps must be regulated by the size of the drawer. Of course, they must not be too large to permit them to lay flat. The length of the hinged edge will depend upon the distance it is considered preferable to extract the drawer from the carcase. The drawer should have a reasonable portion of it remaining in the carcase.

It will be advisable to cut the drawer sides at the bottom to the depth of the thickness of a flap, and hinge the latter, as in Fig. 2. It will then fall in a better manner; but each can be usefully hinged, as in Fig. 4. In some cases the flaps would

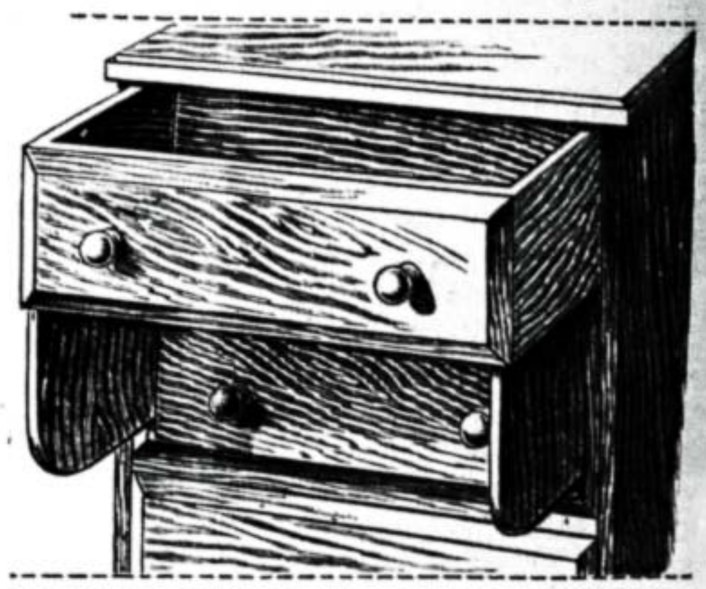

Fig. 1.

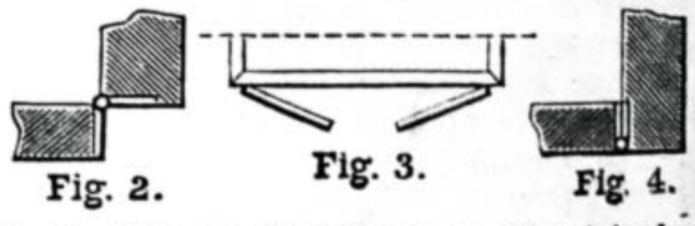

Fig. 2. Fig. 3. Fig. 4.

Fig. 1.—Drawer shown open and sustained on Supports. Fig. 2.—Mode of hingeing Supports to Drawer Sides. Fig. 3.—Diagram showing how Supports fold under Bottom of Drawer. Fig. 4.—Another Mode of hingeing Supports to Drawer Sides.

not fall perfectly perpendicular, but this fact will deserve no further consideration.

It will be best, for some purposes, to have the flaps to touch when folded, and a flush bolt connected to them to retain them in a flat condition, if desired, when the drawer is drawn forth. A strip of baize or other material should be glued to the edge of each flap where it comes in contact with the front of the carcase, when down, in order to prevent injury being done to the latter.

It is obvious from what I have already said that the supports will be desirable under these conditions:—Firstly, when it is necessary to pull the drawer out to its fullest extent; secondly, when it is needful to use both hands in turning over the contents of the drawer; and, thirdly, when the contents of the drawer are heavy—as in the case of tools, builders' ironmongery, etc., when the weight in front will tend to depress that part of the drawer, thus tilting up the hinder portion. In such cases, if the drawers are not yet in existence, and have yet to be made, it will be worth while to consider whether or not it will be better when making the drawers to construct them in such a way as will admit of the introduction of the supports as an integral part of the drawers from the very outset. In order to accomplish

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this in a satisfactory manner, the sides of the drawers must be made deeper than the front, and the side must be cut in such a manner that the excess in depth of the sides of the drawer over or beyond the depth of the front will project and be flush with the surface of the front. Thus, supposing the front of the drawer was 18 in. long and 5 in. deep, and the sides of the drawer 5¾ in. deep and ½ in. thick, it is manifest that when the drawer was placed in position on the runners and pushed in, there would be an open space between the front of the drawer and the rail below it 17 in. long and ¾ in. wide, extending the entire depth of the drawer. This opening would then have to be filled with two flaps each 8½ in. long and ¾ in. wide, hinged to the sides of the drawer in the manner shown in Fig. 4. If the joints in this arrangement were considered objectionable, they might be hidden by placing a wide mocking round the front of the drawer, the bottom member of the framing thus formed projecting sufficiently below the front of the drawer to cover the joints.

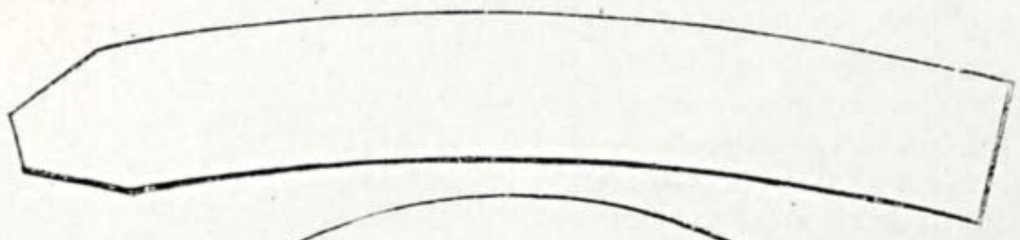

Fig. 3.

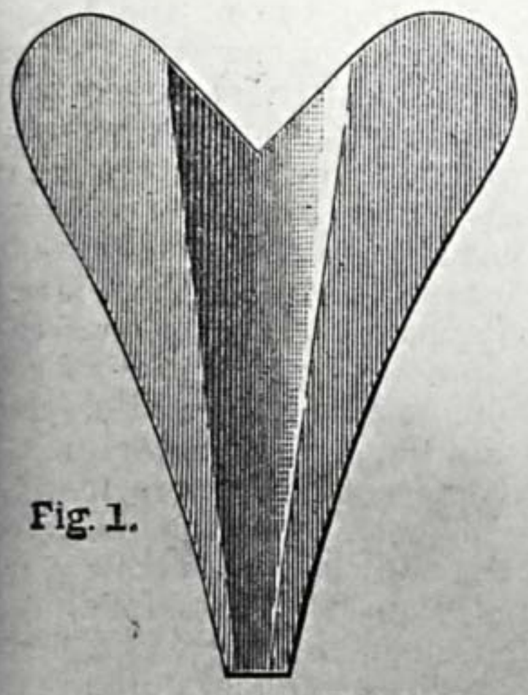

Fig. 1.

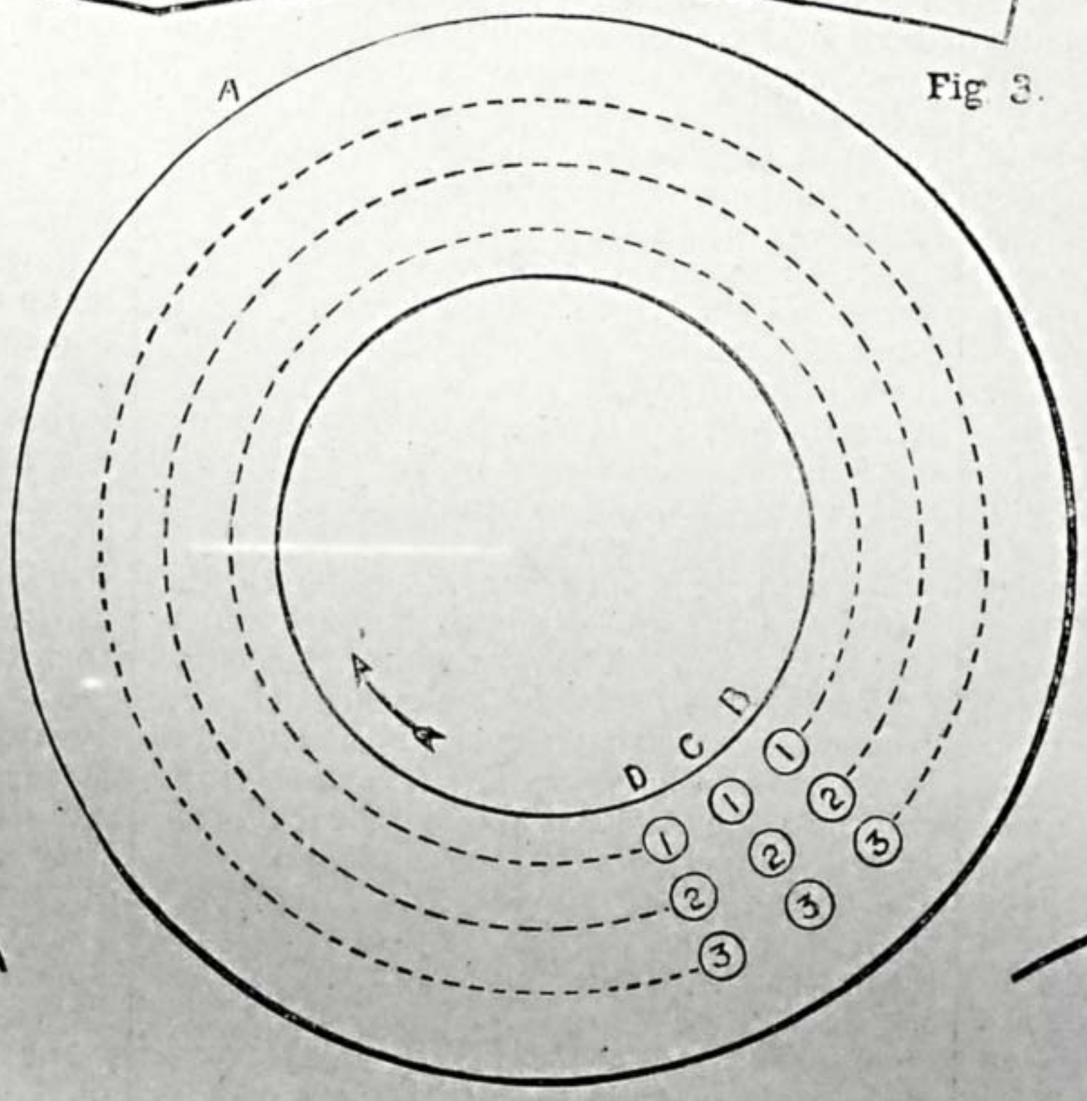

Fig. 7.

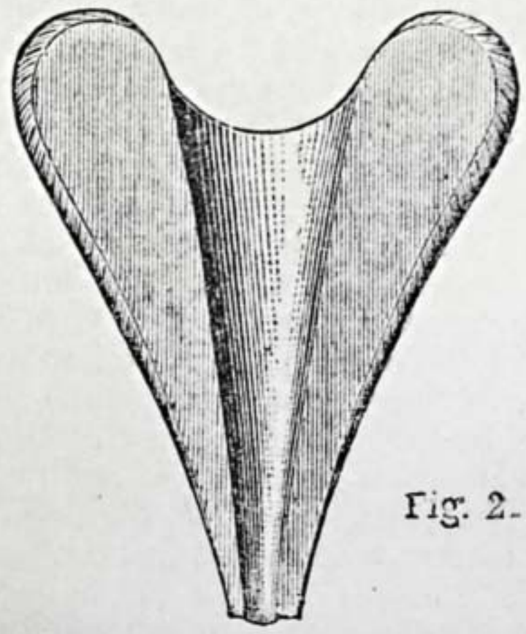

Fig. 2.

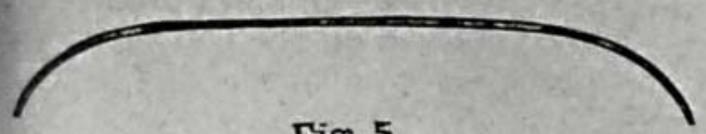

Fig. 5.

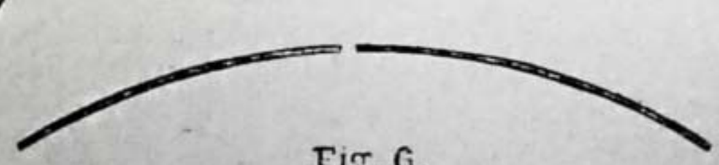

Fig. 6.

Fig. 8.

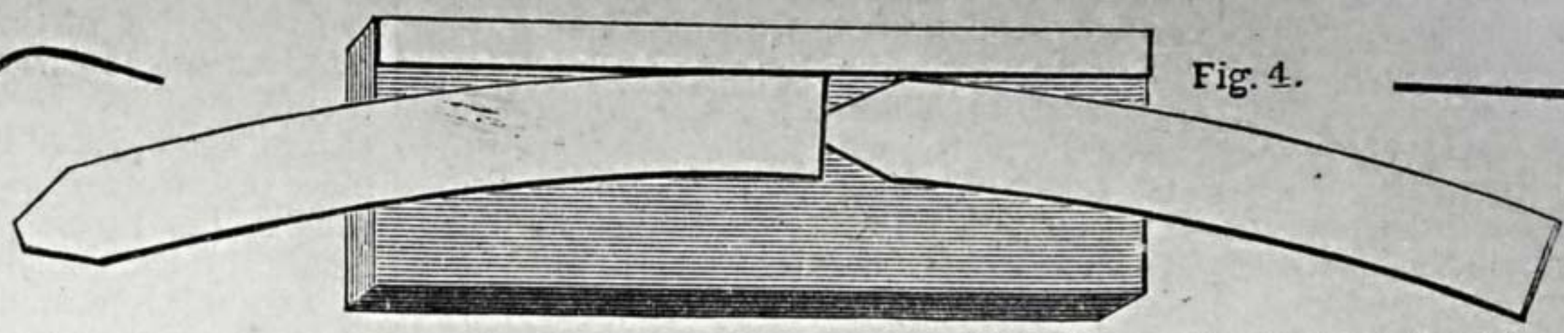

Fig. 4.

Fig. 9.

Figs. 1, 2.—Saucepan Boss. Fig. 3.—Part of Rim, showing Notch. Fig. 4.—Tacking Board for Rims, showing Rim in Position for Tacking. Fig. 5.—Section of Hollowed Saucepan Rim. Fig. 6.—Ditto of Tea-Kettle Cover. Fig. 7.—Saucepan Cover, with Guide Marks for Blocking. Figs. 8, 9.—Sections of Turn-ups.

SHEET METAL WORK.

BY R. ALEXANDER.

THE SAUCEPAN AND KINDRED ARTICLES, GROVING, WIRING, EDGING, MAKING SMALL WORK AND COVER.

THE next thing to do will be to grove the body pieces together. This is best done on a bench plate, which is a flat piece of cast iron planed smooth and about ½ in. or ⅝ in. in thickness and from 12 in. to 15 in. square. Have the wire fold nearest to you, slip one fold over the other, and taking a grover of suitable size and placing it on the seam, form the grove by striking it with a mallet, moving it up and down the seam and increasing the weight of the blows a little until the seam is properly formed (see section of seam Fig. 37, given in page 469). It may then be hammered close with light blows of the square-faced hammer; some prefer to use a very tight grover, and not to hammer down afterwards, or only very little. The next operation is to "wire" the bodies; this can be done on the bench plate or on the crease iron. I mostly use the latter. Take a roll of wire and begin at the right-hand end of the body ½ to ¾ in. from the end of the fold, hold the wire in position with the thumb while you knock the fold down so as to fix the wire, then proceed along the body; the curved shape of the wire assists in keeping it close to the tin, and as it is wired, the body will curve to the shape of the wire; but this will not matter as it has to be rolled. After wiring right along, cut off the wire, leaving as much extra at the left-hand end as was left out on the right-hand end. After wiring all the bodies, pass them through the jenny to smooth down the wiring, which up to now presents a puckered appearance. To do this, draw back the guide by means of the screw which is just under the spindle of the handle, till it allows the wired part of the body to enter. If the top screw is screwed down it must be eased up to allow the wire to enter, and then screwed down a little. Commence at the end nearest to you; turn the handle and raise the body a little; the wheels should have grip enough on the stuff to draw it through; if not, tighten both screws half a turn. The wire will then be nearly tucked in and smoothed. Rolling comes next. Set the top front roller so that it will just allow the seam to go between it and the bottom one without flattening it; lower the back roller so as to give sufficient curve to turn the body to a circle; place one between the rollers, with the wire in one of the grooves in the top roller, press down the body to give it a slight bend, then raise it a little and commence to turn the handle, you will soon see if the adjustment is correct; if the circle is too large, depress the back roller a little, and if it is turning in too much raise it a little. The body will require pulling a little to the right as it goes through, as there is always a tendency to draw to the left. Shaping and seaming will be the next job. The reader may naturally say, "I thought the rollers were to roll them into shape." Well, so they do to a certain extent, but in practice we find that there is always a certain amount to do afterwards; perhaps, owing to one-half of the body being a little thinner than the other, it has rolled in a little more, and then the pulling them out and so on causes them to require a little shaping up; this is done partly before groving the second seam, and partly afterwards. To grove them together use the side stake. Open the wire fold a little where it has been pressed down by the roller, owing to there being no wire in it, lap the piece of wire in that projects from the other side and tuck it in smoothly, turn it on the tool to have the wired part to you, and then grove the seam in just the same way as the first one.

The next process is edging the bodies. This may be done either with the stock shears, the jenny, or on the hatchet; the last-named is only used when there is nothing else to do it with. Edging with the jenny is very easy, and is the quickest method. See that the bottom of the body is quite true at the seams, as, in spite of every care, one part sometimes works up a little deeper than the other. This must be trimmed off or the edge will be unequal. The guide of the jenny is screwed back, so that it leaves about ⅛ in., or less, of the bottom wheel, or rather of the back part of it, and the saucepan body inserted, and the top screw screwed down tight enough to prevent its slipping out as it turns round. Hold the body lightly by the wire and press from you and in towards the guide, but not

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too hard or the size of the edge will increase. Do not make too wide an edge—⅛ in. is sufficient for this size article: more would necessitate a larger bottom and make a clumsy looking turn up.

Next mark out the bottoms—allow as much turn up as there is edge. The size of the bottom, when found and proved correct, should be marked on the body pattern, making two marks with the compass points as shown in Fig. 33, A, B, which will be found in page 469.

The mode of putting on a saucepan bottom has already been described in "Repairing" (see page 414), and need not be repeated here. So we can now turn to the small work, commencing with the handle, Fig. 28, which is in page 469. The first thing to do after cutting them out is to turn them on the bick iron. Some workmen do this with the point of the bick iron pointing away from them, but I myself have always used it with the point towards me, and I suppose that what one is accustomed to one regards as the best way. Place two together, and with the mallet bend one edge slightly on the tool, then grasping the handles and tools together with the right hand, bend the handles round the tool about two-thirds the required distance. Do this with as many as you have, then slip them apart, and then bend the other edge with the mallet as before, and then finish turning them round; lap about ¼ in. The flap must not be turned with the handle but left flat, and after the handle is turned bend it back, and with a small hammer tap it close to the handle; next, punch out some studs with a suitable size hollow punch and hollow them up with the stud boss and punch, or with a stud hammer on the lead piece; these studs must then be edged on a small tool, slipped on the handles, and soldered round. The flaps of the handles can then be knocked back and fitted to the shape of the saucepan. The boss (Fig 29), apron (Fig. 30), and cover handle (Fig. 32), all in page 469, will next be made. The bosses are held on the hatchet stake at the dotted lines and a blow or two struck. The flaps are then bent down, next turned over, placed on the tool in the centre of the boss, and pressed down each side; this roughly shapes them. They are finished on the extinguisher stake with the mallet, and the outside edges are very slightly bevelled as a sort of finish. Fig. 1 shows it as it comes from the hatchet; Fig. 2 when finished. The apron and cover handle are folded with a small fold, then the apron is false wired on the hatchet—that is, it is held on the hatchet by thumb and finger, the folded part just lapping over the edge of the tool; run lightly along with a mallet, and on turning it over it will present the appearance to the uninitiated of being wired. Cover handles are frequently treated in the same way. It does very well for common goods, but for good work they ought to be wired with 15 in. or 16 in. wire. The tip of the apron should be bent back slightly with a tap of the mallet, and the hollowed out part bevelled down a little on the hatchet with the round end of the mallet.

The small work is now ready to be fixed to the saucepan. First tack the handle to the saucepan by a drop of solder placed so as to tack the points of the handle and the flap to the body at the seam that was last groved; next place the boss in its place behind the handle and tack that also top and bottom. The next thing is to solder the apron on; place it in position so that the point is in the centre of the handle and the wide part just below the level of the top of the saucepan, and fasten it with a drop of solder on the point, then solder along the flap. The next job is to rivet the two ears of the boss, and the flap of the handle which is beneath them; rather small rivets should be used—14 oz. will do very well. The riveting in this case is done by placing a rivet on the tool and then placing the saucepan on it and giving a tap to find out where the rivet is, and then drawing it through with a set in a similar way to that mentioned in "Relining Coal-Scuttle," page 414. This guessing of rivets requires a little practice before proficiency is attained; but when you are used to it, it is easy enough. I have seen lads put the rivets in two dozen bottle tops (which means six dozen rivets) in less than twenty minutes, and bottle tops are more awkward to do than saucepans. I must mention here, or I may, perhaps, be called over the coals for omitting it, that there are tools called follies for punching the holes for rivets in such things, and where a great number of articles have to be made they are very useful. I have two or three pairs hanging up on the wall of my shop, but never use them.

After riveting, all that remains is to solder round the boss. Commence at the left-hand side with a good amount of solder, let it well run in at the part where the handle joins the saucepan, and from thence down one side of the boss and up the other, well soaking in that side as well, and then over the bridge of the boss.

We will next turn our attention to the cover, and the first thing to make towards this is the rim. The pieces for this come off the body as I have before mentioned, and I have also said that the rim is marked out by means of a home-made tool called a flue rim. To make this, take a pair of long-legged compasses, or if these are not available a piece of string or wire will do, and on a strip of tin 2 in. wide and 20 in. long, mark a line with a curve equal to × × in Fig. 33, which will be found in page 469. The compasses, if set at about 5 ft. or 5 ft. 6 in., will give the correct radius if string or wire is used; stick a bradawl in the floor at one end of the string, and with another awl at the other end holding it quite upright describe the curve; cut it along very carefully, and fold the straightedge in the machine and knock down with the mallet, and you have a short straightedge and flue rim combined, and if you take the trouble to set it out and stamp the figures on it, a rule also. The object of cutting the rims slightly tapering instead of straight, is so that a better fit may be made, and they are easier to put on and take off. This flue rim pattern will do for straight-sided round articles, and for articles larger at the bottom than at the top, but for articles that taper smaller at bottom, such as slop pails, a pattern with a smaller radius must be used, or the rim would press the sides of the article before it was fully down to the wire. To mark out the rims, take the pieces for that purpose, and placing the flue rim as near the top as possible mark a line; then take the compasses at the ends of the line, divide the remaining space into two, pressing the compasses to make a mark, then draw lines to these marks with the flue rim; if you were making a dozen rims off a sheet of tin you would proceed in the same manner—it is quicker and truer than cutting out one piece of rim and making the others from it. When all are cut out, notch one end as shown in Fig. 3. The two pieces can next be soldered together; this, and the soldering after being turned round, is called "tacking the rims." To do this, a board will be wanted; the side pieces of one of the 14 in. by 10 in. boxes, if fairly flat and smooth, will do very well. Take your square, and with an awl mark a deep, straight line across it, and then take the flue rim and mark a line with that touching the straight line in the centre; to tack the rim, place one over the other, as shown (Fig. 4), and solder together, holding them down at A with an awl or piece of wood till cool.

The next operation is folding the rims. Owing to their curvature they cannot be folded in a machine, but must be done on the hatchet. We usually do two at a time, but beginners would probably fail in attempting this, so try one first. They are folded on the inner curve; let them pass under the left arm and commence at the plain end, so that when folded the solder is outside—a full ⅛ in. will be about the size; larger rims, larger folds. Do not fold right down at once over, but go over it twice, then knock down flat on the crease iron and turn round two at a time in the rollers; the ends of them will require a little rounding up before tacking to the size of the saucepan. The method of doing this is as follows:—Place a rim in a saucepan and make it a comfortable fit, draw it carefully out and tack (outside first), then replace it to see that it has not shifted, and then tack inside; some cut all superfluous length off, but I think it best to leave it if there is not a great deal too much, as it strengthens the rim. The next process is to edge the rims, which will be done in the jenny, the same as the bodies were done. The covers must then be marked and cut out; more margin must be allowed than for the bottoms because of the hollowing up, about ¼ in. larger all round than the outside of the rim will be sufficient in this case, and after they have been hollowed up and found to be the correct size, mark it on the body pattern the same as before mentioned for the bottom (see A C, Fig. 33, in page 469).

We now come to an operation requiring some skill and practice to make a good job of it, and that is the hollowing or blocking, as some call it, of the covers. This calls for some remarks respecting a tool, if I may call it such, that has not yet been mentioned—that is, the block. This is a very important piece of furniture, and I will try to describe it as well as I can. It should be about the height of the bench. If intended to work at it standing, as many do, it may be a couple of inches higher, and if sitting down to it, a little lower. The reader may naturally say, which is the best? To this I answer that it all depends on circumstances. If a lot of work is to be hollowed up—say the sides and tops and covers of one dozen tea-kettles—I should myself prefer to sit down at it; but if only used occasionally I should stand. There is this to be said about it: if the block is high and you sit down to it, there is no power in the blows, as the arm is cramped; and if standing to a short block, it is back-aching work. So now having explained the matter, you can, as the showman says, "Pay your money and take your choice." It should not be less than 15 in. in diameter at the top, and a little larger at the bottom, and should be of a tough and close-grained wood, such as beech, walnut, or apple. They can be got cheaply at any timber merchants. The top must be sawn off smooth and level, but need not be planed. To get it ready for use, take one of the hollowing hammers of a good size, and about 3 in. from the edge hammer a depression, or hole, if you like to call it such, in the block; let the heel of the hammer—that is, the part nearest you as you

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hold the handle—do most of the work, so that the hole is deepest near the edge, and slopes away to nothing toward the centre of the block; it should be about ⅛ in. deep in the deepest part; it will get deeper by frequent use. Another place may also be made a little less in depth than the first, and with these two we can commence. Covers are, in making up new work, hollowed up four or six at a time, according to the thickness of the stuff. Covers of 1 C and 1 X may be hollowed in lots of six, and for 1 XX or 1 XXX stuff, four at a time will be enough. Before commencing to block up, describe a small circle—a little less than one-third of the diameter will be the size. This is for a guide for the workman. In blocking, many people do not use it, but it is a good plan; nevertheless, it is also the limit of the hollowing, as saucepan covers are not hollowed right to the centre, but a tea-kettle cover would be; see Figs. 5 and 6, which give a section through the centre, showing the difference between the hollowing of a saucepan and a tea-kettle cover. Commence to hollow by grasping the lot of six or four, whichever it may be, at A, Fig. 7, thumb inside, and hold the covers over the shallowest hole, and so that No. 1 on line 3 comes just over the middle of it; then give firm blows of the hammer as shown, 1, 2, 3, 1, 2, 3, 1, 2, 3, on lines B, C, D, in the direction shown by the arrow, and so on all round; the covers will have come up considerably, but will present a very puckered appearance, which the beginner will probably look at with some misgivings as to his ever being able to get it smooth, but patience and perseverance will soon accomplish this. Next go round in rings of blows as shown by the dotted rings in order as they are marked, 1, 2, 3; this will considerably smooth the covers, but they will not be hollow enough yet, so must be taken to the deeper hole and the same process gone through. This will most likely bring them up sufficiently, which may be ascertained by placing a rim upon them; they should show about the same size as the rim; if the rim drops within the inner cover, they are not hollowed enough (unless they have been cut too large); and if the rim hangs over the cover, you will find it a job to get the rims in, but hollow up to a good height if possible, as a flat-looking saucepan-cover is an eyesore to any good workman. Having got them the right degree of hollowness, the next thing is to smooth them off; this is done with a slightly flatter faced hammer, especially for the centre part of the cover; many workmen, in fact most, shift the covers before commencing to smooth—that is, shake them apart and turn each round a little way so that the puckers are not opposite one another. Commence to smooth on a flat place on the block, working from the inner circle outwards and finishing at the edges with the hollowing hammer.

I trust I have made this process fairly plain to my readers; it is a very difficult thing to explain on paper—in fact, I have never seen it attempted before. The next thing is to throw back a flange in the jenny, about ⅜ will be the size for the covers under consideration.

Place the cover between the wheels and screw down, not too tightly, and work round carefully once, holding it the same as for jennying up a bottom; run it round several times, gradually raising it till it assumes the shape shown by the section line (Fig. 8). Let the first one done be the inner cover—that is, the one nearest the hammer in blocking; offer the rim to it, and if it is the right size and shows sufficient to allow for the turn up, the others can also be jennied the same way; the outside one will want a little trimmed off, because, if the inner one was the right size, each one nearer the outside one is a slight degree larger; but in fitting the rims in, there is generally a little variation which makes up for it.

To turn up the second edge which covers the edge of the rim, proceed exactly as in turning up a bottom (see section line Fig. 9, which also shows the rim fitted in); this is a very easy job, and needs no explaining. There may be one or two rims which appear too large to get in; to help them, rap the turned-up edge of the cover back a little as described in the instructions for putting on bottoms, and if this does not prove sufficient, the rims must be pared a little. Pane down on the beck iron and the cover is finished, with the exception of putting on the handle. The handle, Fig. 32, for which see page 469, is folded and a small wire put in, or false wired like the apron; turn into a semicircle the flaps thrown off each side and soldered to the cover by tacking each side *under* the handle. The correct position for the handle is found by describing a circle on each cover of a diameter equal to the width of the cover handle outside the flaps. Put a small rivet through each flap, using one of the round heads or a block hammer fixed in the vice to rivet on, and the example which we have been studying is completed.

THE ART OF GRAINING.

BY A LONDON DECORATOR.

Graining Italian Walnut Wood.

Most of us are familiar with the nature and beautiful markings of the wood of the walnut-tree; and although he would be a *rara avis* indeed who did not know its fruit or kernel, there are undoubtedly many persons who could not distinguish the growing walnut-tree half so readily as the invaluable oak or the less useful chestnut. Judging from the name by which it is popularly called in this country, one would suppose that the *nut* was, if not the only one, albeit the principal feature of the tree's commercial value. That is not the case in this age, we know full well, since the enormous quantity of walnut wood that is used annually in the manufacture of pianos alone must be an item of great value.

To all intents and purposes we may consider the walnut-tree a native of this country; for although we cannot be certain, as is highly probable, that it came here "with the Roman invasion," the knowledge that it has grown in England for over three hundred years is surely sufficient for its classification as such. Although its original "native land" is generally believed to have been Persia and the regions of the Himalayas, the walnut-tree is now largely cultivated throughout south and temperate Europe, from whence, as well as from still more eastern parts of the globe, enormous quantities of walnuts are exported. More southern and sunshiny latitudes than those of Great Britain are necessary, however, for the tree to attain to full growth and a ripe age; hence it seems to come naturally about that the wood of the *Italian* walnut—from the country where the beauties of nature and art alike seem always pre-eminent—should be the most richly marked and highly prized.

Italian Walnut Wood is chiefly noticeable from its masses of beautifully knotted and curled grain, rather darker in general tone than the ordinary "piano" variety, but equally rich and clear when properly prepared and polished. In compiling this lesson upon graining such a very useful and ornamental wood, the heading of my paper was used, not with a view of devoting the space entirely to imitating none but the very richest variety, but chiefly to distinguish in a literal sense as well as in the learner's mind the ordinary curly, knotted, and mottled walnut of commerce from its less pretentious but equally serviceable relation, the black walnut, or, as it is generally termed, *American Walnut*.

Grounds for Walnut Graining, although varying slightly in *depth* according to the intended finish, should always be of one class of colouring: viz., a soft drabby brown. Words are a poor means of interpreting colour, but if the prepared white lead paint is stained with yellow ochre and Venetian red, used in equal proportions, until we get the desired strength, and the resultant mixture afterwards sobered down with burnt umber until it becomes a "leather" colour, then the worker will obtain the tone alluded to. If we wish for a lighter class of walnut graining, one in which the grain and figure will be more distinct, the same tone should be used, only, of course, the white lead being in greater proportion. Very often one finds walnut being grained upon paint in which scarcely a trace of umber can be seen; the consequence is that either the graining colour is used weak and thin, so that the graining, viewed on its completion, looks "foxy"—*i.e.*, gairish—in colour and feeble in form; or else it is the other extreme, in which the figure can be traced from the opposite side of the road. The best demonstration any student can have is to grain a panel upon both the bright and the drabby grounds, varnish them, and not only compare them with a piece of the real polished wood for natural colour, but further, carefully weigh the relative merits of each for *repose* and *richness*.

Graining Walnut Wood is—to any worker who has mastered the use of his water-graining brushes—a most pleasant and entertaining work. The usual method is the distemper, or water-colour process, and the tools required are similar to those previously advised for Pollard Oak. These will be found illustrated in page 40 of the present volume, and need not be here recapitulated. The pigments required, to more or less extent, for walnut imitation are the invaluable vandyke brown, burnt terra di sienna, lamp or ivory black—preferably the latter—and a little of Prussian or indigo blue. These pigments are already familiar to those readers who have followed this series through the preceding papers. They are material colours of strong natural staining powers, and an ounce of each will suffice for a large surface of graining. For home practice and all ordinary purposes, the blue pigments can readily be dispensed with; they are rather costly, and may be difficult to obtain ready ground in water. The only one of the list that can be rubbed up upon the palette is black; all the others are useless, so far as good work is concerned, unless very finely ground and of the best quality. Walnut being an imitation into which black, a bad "binder," enters largely, it is advisable to use beer and water in about equal parts for our fluid. Before commencing the work, the grounding paint should be lightly glass-papered with "No. 1" or "1½," and well dusted down. If the paint is very hard, and has been standing

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any length of time, we must also prevent our water-colour from cessing—running off—by rubbing the ground with a little dry whiting on rag, or by giving it a preliminary rub over with a sponge of beer-wash. Having now at hand a little fluid stained with vandyke and sienna—the darker our imitation is the more vandyke in proportion—we take a large worn-in tool or the large mottler, and rub over our surface, not too sparingly, but avoiding sufficient to cause it to run. Before, however, we take further action, there must be a mental decision as to the disposition of the figure. For instance, given a panel say 24 in. by 15 in., we might occupy the greater portion of it with one large cluster of knots and encircling grain, and surrounded by plainly grained parts, as is characteristic of the best Italian. Again, we may get another good effect by working in two or three separated and smaller clusters of knots in one flow of grain—an appearance which is more common. Mottling this stained wash is the first action; and if we work on the former plan we shall mottle our surface small and delicately across the panel, but *fully* under the greater part of knot-mass and more sparingly and broader under the surrounding plain grain. We also, whilst mottling straight across the panel, follow the general curve of the outer grain (Fig. 1).

In imitating the second variety, we may mottle on more regular lines straight over the width of the surface, accommodating it slightly to the intended plain and knotted parts, but following no decided curve (Fig. 3). Whilst still wet, we soften with the badger and let it dry. The next step is to imitate the delicate pores or under grain, and this is obtained by using the thin "oak" overgrainer. By separating the hog-hair of the brush after it is charged with colour we get distinct divisions, and in this manner we go over the panel, always working in wavy, "tremulous" lines and curves across the previous mottling. In the same manner as advised for pollard oak we must carefully soften this work outwards or upwards whilst wet, and thus obtain a light inner, and dark outer, edge or grain. This must be kept quiet and subservient to the after-process; and if we desire it, upon the ultimate plainer parts we may subdue the under grain and stipple it instead, as with mahogany.

The next process is to imitate the curly and prominent grain of the wood, and which, upon inspection of a real sample, will show a considerable variety of colour *tone* as well as *depth*. Some leading veins will appear quite black, others a rich warm brown; whilst the bulk of them give various shades of deep brown of the vandyke tone. Now, in order that these veins may sink into and become, apparently, part of the wood, we adopt a double method of softening them. Taking the large mottler, we well rinse the colour out of it, and then draw it quickly and lightly down the panel until the latter is nicely wetted all over.

Fig. 1.—Graining Italian Walnut: first stage.

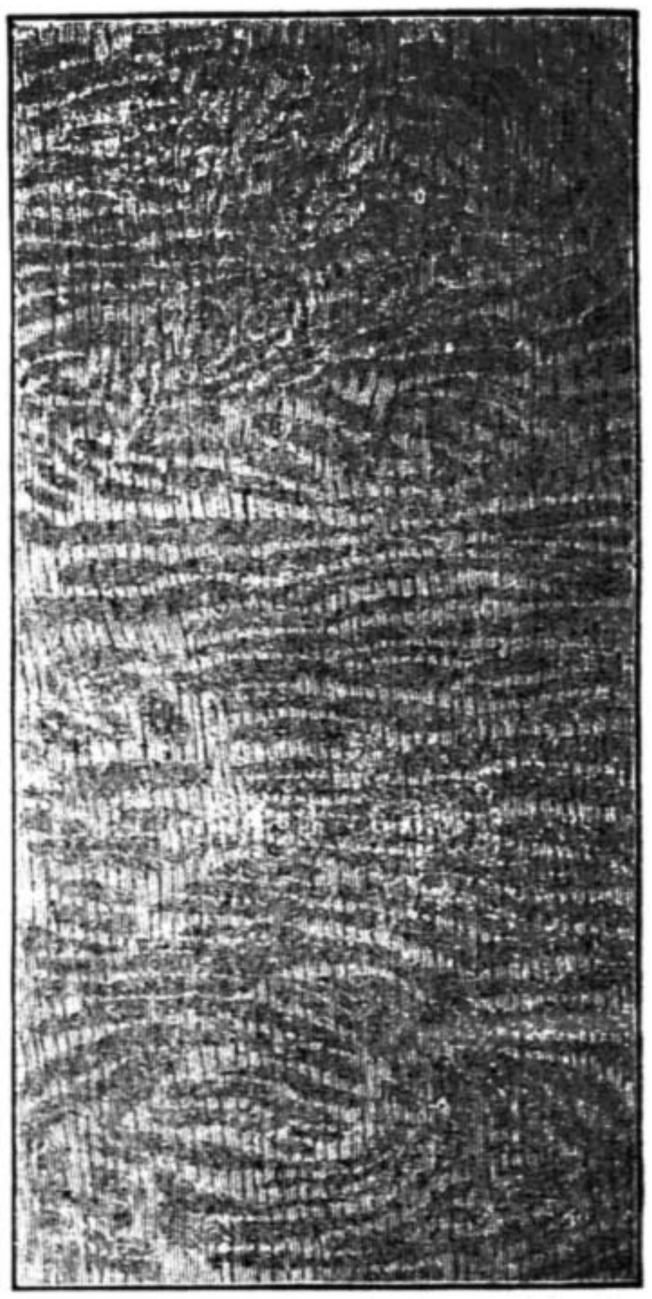

Fig. 2. — Graining Italian Walnut: Mottle and Undergrain.

Fig. 3. — Graining Italian Walnut: final stage.

Fig. 4.—Graining Italian Walnut. Fig. 2 with Top Grain but unglazed.

The thin hog-hair "oak" overgrainer is then dipped into a stronger beer-wash, and worked into our black and vandyke pigments—which latter should be rubbed up separately, and ready to hand in a liquid form. The make of the overgrainer, which naturally separates itself into tufts of ever-varying size, enables us, therefore, to work in the prominent grain with despatch and variety of result; and the effect therewith obtained is infinitely superior to anything we might attempt with the pencil, and by making one vein at a time. As this part is the most important in the imitation, the mind must work as rapidly as the hand. The main lines of the panel we have already shaped out by the mottling, etc.; but whilst we duly follow that lead and work the veins across the mottle, we have the natural play of grain, the sharp and subtle curves, the widening out and closing up of the veins, caused by pressure upon the tufts, and the variety of colour—all these points to see to in the manipulation. For the richest Italian walnut (Fig. 4), although by expert twisting of the brush we may make the most natural-looking masses of knots and curly grain, we may with more advantage leave the inner parts for filling in with a pencil and black pigment. The advantage of working the main grain upon the wetted surface is that the veins partly soften themselves, and we also get more time for the process. This softening with the badger must be effected as we go along, and by gently brushing across the grain we get a natural light and dark edge. When the veins lie very close together we are liable to blur one into the other; this is an effect we must avoid, even at the cost of a few hard veins. From this fact it will be gathered that the grain must not be worked too close nor too regularly. If, after making the best use of the overgrainer, we desire to further "work up" the panel, we proceed to wet it all over as before, then put in the inner knots, touches of black or strong veining, with the sable pencil, and finally soften as before. Should we attempt to do this without the wetting, there is a danger of spoiling the panel; inasmuch as we cannot judge how the colours and grain look when varnished, which the water enables us to see.

Glazing Walnut Graining is the last process, wherewith we obtain the final colour, and subdue and heighten different portions of our work. It is in this glazing treatment

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that the advantage of sober grounding colour is most apparent, as we are enabled to use rich and warm pigments without any unnatural crudeness. Before this glaze, or transparent wash, can be applied, we must secure the previous work with either japanners' gold size or, far more preferably, with the same copal varnish as we finish with. When the binder is dry we spread the wash, making some parts quite warm with the sienna, and other parts, especially the knotted work, stronger and deeper in colour with vandyke and black. If extreme richness is wanted, the introduction of a little of the transparent "cool" blue, judiciously placed, will, by force of colour-contrast, help to this end. The tone and depth of the glaze being right, and the same spread evenly, we take the damp wash-leather, and roll it over those parts where a soft mottling effect is wanted, and then, with the thumb and leather, wipe out the brighter lights across the knotted work, and carefully soften the whole. As our coat of varnish has "brought out" (Fig. 2) all the work previously put in, we are able to judge if it still requires any finishing touches, and if so, these can be done whilst the glazing is wet. One good finishing coat of copal varnish can now be given, and, if possible, let it have an extra coat a few days afterwards. If aiming at a smooth surface, like polish, it is necessary to rub the first coat slightly down with thick felt and finely pulverised pumice-stone, used with water, and finally, well rinsed down. A serviceable, but, of course, less effective, cheap plan is to rub with fine emery-cloth, and then wash down. In every case have a care that the graining is not rubbed into little white specks, arising from want of fineness in the paint, etc., beneath; far better to sacrifice the smoothness.

The Arrangement of Walnut Graining upon Woodwork is a matter worth a little attention here. In the first place, the worker must remember the cost of time, and therefore aim to get the most effect and natural breadth according to these commercial circumstances. Let the panels of doors, and where most seen, be the best and richest portions; keep the mouldings dark but quiet in grain; if acceptable, black them as *ebony* imitation; and in every case let the surrounding stiles and rails be a foil and relief by their plainness to the richness of the panels. Let rail and stile be equally distinct in *grain* as with oak, but rather less in *depth*, since there is not in nature the same play and action of light as with the former. Always reserve the pencil for only the best panels, such as will probably have a close inspection; but even then do not sacrifice breadth to detail. These directions, if intelligently followed and persevered with, in conjunction with a good piece of mounted veneer, will soon lead to successful imitations of walnut wood.

CLOCK CLEANING AND REPAIRING.

BY A PRACTICAL HAND.

Later Grandfather's Clock.—Next is the more modern grandfather's clock, with minute and seconds hands, a better style of striking part, and going for eight days without winding. The repairs and putting together are the same as directed in the last paper (see page 581), except a centre wheel, which passes through to front to turn minute hand. This wheel must be replaced first, then the large wheels, etc. Now the difficulty is the striking part (again see sketch, Fig. 1); A is the counting lever; B is the small arm which turns it; C is the arm which drops on to D when

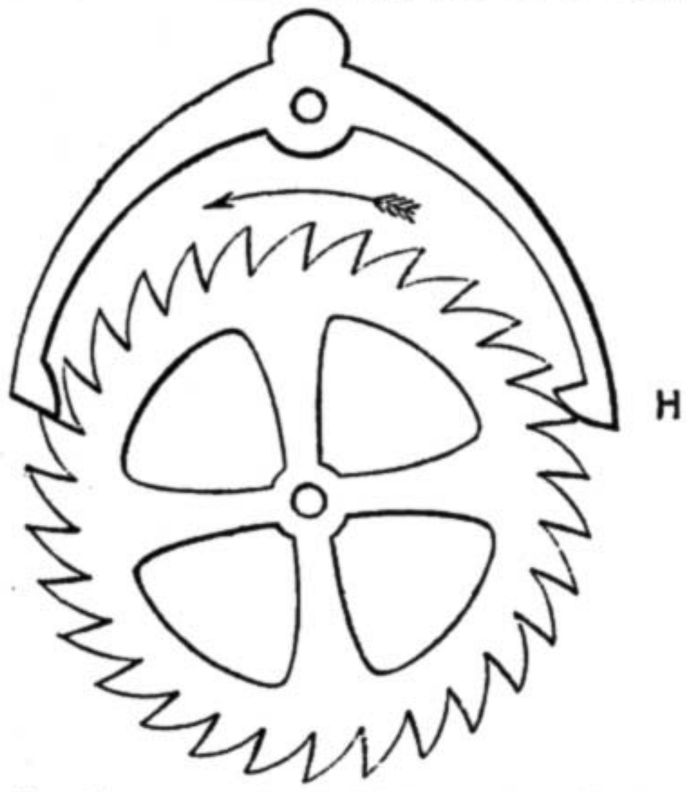

Fig. 2.—Escapement of Modern Grandfather's Clock.

giving warning, and, according to the indent of D upon which it drops, so it strikes the number. This plan will not let the clock strike a wrong number; the deepest indent is twelve o'clock, and so on. You should replace this wheel so that it drops about the centre of each section; E, of course, turns round in twelve hours. In replacing the pin, the wheel must, as in the last paper, have part of a revolution for warning. The hammer at rest, and the going wheel F at right-hand side in this make of clock, replace so that the wheel carrying the minute hand would point at sixty if the dial were on; and so place the same-sized wheel geared into it that its pin drops the lever G for striking then, or your clock may strike, like one I saw in a farmer's kitchen, at ten minutes from the hour. They had got used to it, he said; it did not matter. Now replace dial; and if well cleaned and carefully oiled, it will go from twelve to eighteen months, and require nothing. Common Dutch clocks are deemed out of date, where we will leave them. The American replaced them, and they are fast disappearing, though some may desire to put one right.

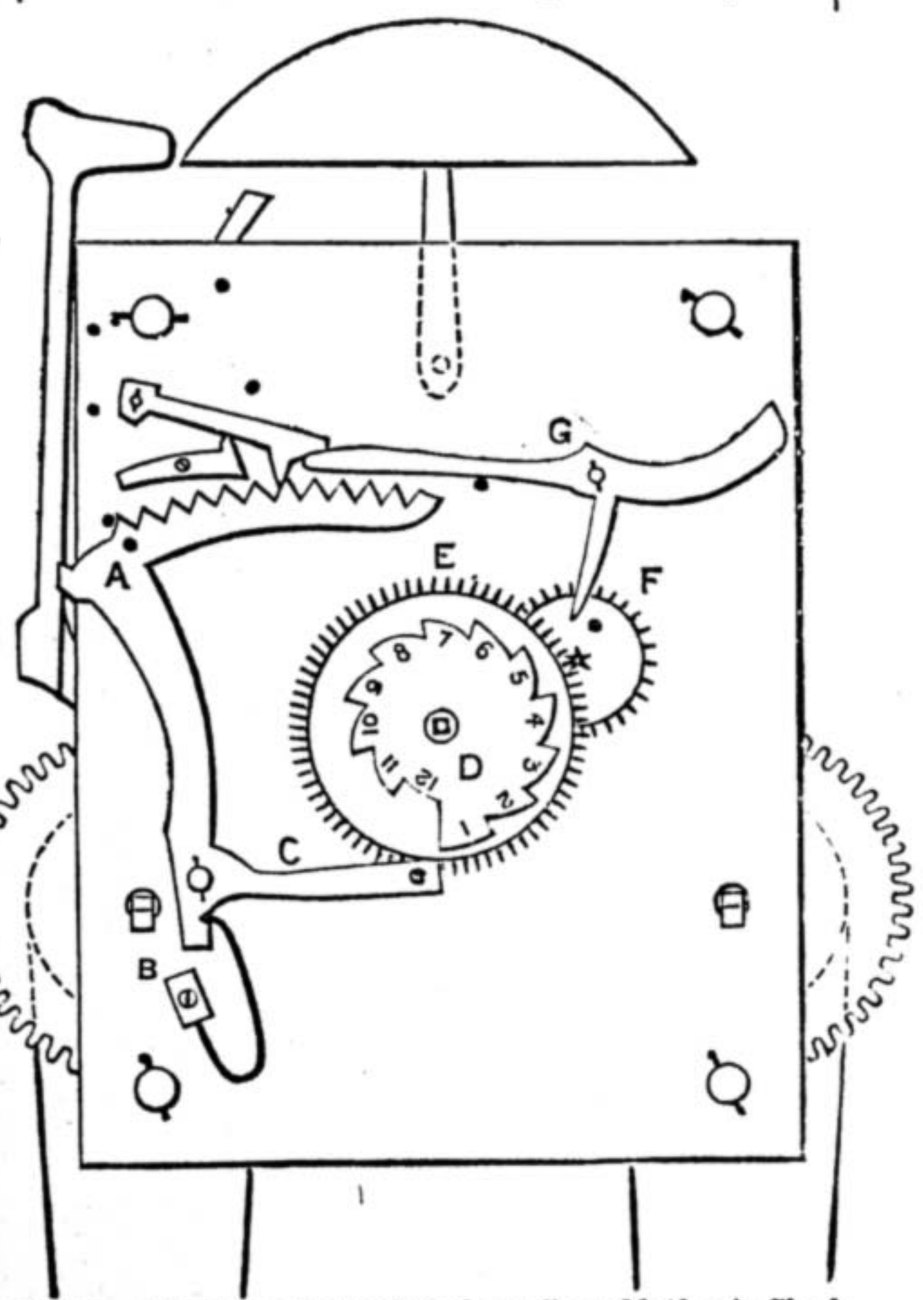

Fig. 1.—Striking Part of Modern Grandfather's Clock.

Turn dial pins, take off hands and weights, draw out two side pins at the circular holes, and unscrew small piece of wood at the top; draw cords over the pulleys at the outside case, and notice how all the parts are arranged—they are not so easy as an English clock. Now draw out the five pins, and all is asunder; examine, as in all clocks, pivots, teeth, holes, etc., and repair same way; clean in paraffin or kerosene oil, and replace the centre wheel and two large ones; so on with each until the whole are in. Now comes the difficult part—the levers. Place in the lifting lever, which is shown in sketch given in Fig. 3. A is the counting lever at rest in count wheel, the lifting and stop lever B (Fig. 4) goes in the two highest holes above escapement; this is acted upon at C by D fixed to E, the hour hand. Slip on front plate, and try if the warning is correct, also striking of the hammer; the rest cannot go wrong in this make of clock if all is correct. Oil and replace into case, then draw the cords through opening up the side of pulley, towards middle, using the hook of pendulum rod; be careful of the tip, you do not bend or break it; screw up the piece of wood, affix the two pins, and replace weights at the side you left them in the case. Now attach rod through the crutch, and replace the ball; stand it quite level, and listen to the beat. If unequal, raise the whole clock on either side and bend the wire part of the crutch towards the side you lifted when it beat right, a little at a time, until correct. Should the clock pendulum have a poor swing, you can alter that by taking off the pallet part, and turn a *very* little the part upon which the pallet works—you will see it is riveted to the frame for that purpose. Now try until you have a good swing; if you turn it too near the escape wheel, it may not escape at all; so, gradually, try it back again until it escapes with a fair swing. All will now be right. If the hammer is too close by accident to the gong, it will sound badly; bend hammer wire from it when at rest; see that gong is well screwed up for a good sound.

American Eight-Day Clocks.—American Gothic cases are similar, except springs instead of weights; in all else they are the same. Some do not strike, so are easily cleaned. The American eight-day circular clocks are now most used; those manufactured by Seth Thomas I always found to be best finished; springs of superior quality, and the wheels stronger and more durable—no matter whether a small mantel clock or a good hall clock. To clean the circular eight-day, proceed as before stated: the only difference is the extra wheels and longer springs to go eight days; all else is the same—the drop of levers into the spaces of count wheel and stop lever. So replace wheels that stop lever has hold of the indent edge when count lever has fallen into the centre of its section. This you do by moving wheel carrying the counting part on

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from pinion of next wheel, so that each works correct, the beat and tone of gong as before stated.

English Eight-Day Clock.—The English eight-day kitchen, or office clock, a sound, well-made, circular clock, costing £3 to £4, does not strike, but its ticking even tells you it is well made and of good quality, though unpretending in its appearance. This clock, after you have unscrewed the three dial screws and removed the hands, has, you will find, a fusee wheel upon which the gut cord is fixed to the large spring barrel. This clock, before you take it to pieces, must be run down, or you will have a mishap; do this by unscrewing the two screws holding the pallets and crutch at back; then let it run until all is unwound from the fusee—do not let it run too quick; take off front plate, but before doing so, try what tension is on the cord. Now, if there be too much tension on the cord, and you set it too high, the cord would break at last turn, and startle you much more than is pleasant. Notice a small flat spring at back part of minute hand. Clean and repair all as modern eight-day grandfather's, being nearly similar to its going part; then replace drum and fusee centre wheel first, and the other wheel and escape wheel; pallet you can replace after front plate is on. Now set up tension as before, by turning ratchet on main spring; and when the same pressure is on, replace pallets by putting crutch part through round hole of back plate from inside, and screw the part to hold it in its place. It will, after you wind up, commence to tick quickly; if all is right, replace it in the case, and, perhaps, it would be better for you to try it a few hours before putting dial on; if going all right, then replace dial and hands. It will not require setting into beat, being too well made, and crutch not easily injured. When on the wall move it to its proper beat, and make a pencil mark, so that, in winding at any time, the most ignorant servant or office youth can put it right.

Vienna Regulator.—Next in order is the Vienna regulator for the hall. These clocks, when they have weights, are fairly well made, though many imitation ones are sold at stores, auctions, etc; they go with springs, and are poor affairs, having a worse movement than common American ones. To clean a proper eight-day one, unscrew thumbscrew underneath, and slide the works out, having, of course, previously taken off the weights. You will find the parts are similar to the modern eight-day grandfather's clock, but on a smaller scale, so that the description of cleaning and repairing is the same; if only one weight and no striking part, it is easily cleaned. The pendant action is different; only the crutch is arranged with a single pin, which works into brass hole in pendulum rod, which is made of deal, and the best thing for a pendulum. The atmosphere changes its length so little that that is the secret of its correct-going qualities. To put this clock into good beat, after you have screwed case to wall, with the two thumbscrews near the bottom, you will find a thumbscrew on the crutch; turn this once or twice, and listen if you have made it better or worse; turn the way it improves, until a fairly equal beat is obtained; and this class of clock you may depend on. The imitation one will do for a time, going fairly well, but no extra time keeping, as the spring towards the end of the week is weaker, and the clock alters so that it gives the real ones a bad name, as ordinary folks do not know the difference.

Marble Clocks.—The eight-day and twenty-one-day marble clocks present finer work, more like watch cleaning and repairing. Turn the clock round; at back you will find, on opening the glass, that two screws with long strips of brass hold works into case; unscrew these, and then proceed by taking off the hands, and then the dial. Now examine the striking part well; notice the lifting levers, and see the arrangement for striking the half hours; how simple, but how well, it sounds in an advertisement, "the hours and half-hours!" You will see it simply has an indent twice as wide as the ordinary, so that the lifting piece drops after it has struck one, whatever hour was struck previous. Take off the dial wheels, and then place your finger on the second going wheel, while you unscrew the pallets; then let it down. The letting down of striking is worse for an amateur, as I fear him letting down ratchet or spring, and to open works, however carefully, is too much. Best place a small piece of paper under the counting lever, and leave it to strike down (safe, but slow). When at the bottom, unpin the four or five pins, and take off plate, with the other plate on your bench. Now make yourself acquainted with the parts, as they are fuller to view, and take each one out, keeping the going from the striking wheels to spare you annoyance. Clean them well as if a watch, polish all with brush, and see if holes are in good order, pivots, teeth, etc.; if one of those with visible escapement is on the dial outside, be careful in handling pallets, as you can easily put it out of beat. Place centre wheel in (after oiling, half a drop to each hole, say), and then each barrel, the going wheels, and the striking part; the levers you cannot get wrong, as they only fit in their own holes; besides, by this, if you have read previous papers, you will know what each part does; place them so that the hammer is at rest when stop lever has the wheel against it, and the pin wheel has ¾ of a turn to make.

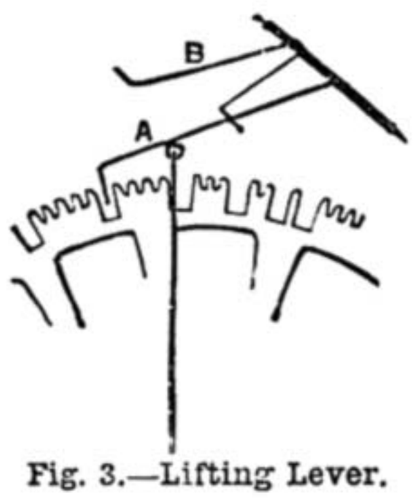

Fig. 3.—Lifting Lever.

When all is in except pallets, replace the top plate, which you have oiled, and before pinning up, turn going barrel a time or two: it ought to run particularly sweet, so that the escape wheel cannot be seen only as a solid piece, looking edgeways, unless pinion has got injured; if so, carefully straighten, as described in previous papers. Now turn up striking part a little, and let the going move slowly to see whether it lifts and warns properly; then if it strikes correct numbers, try it all round: this will save trouble after. Notice if hammer is at rest; if not, study a few minutes how many teeth the wheel and pinion above it ought to be changed. So as to do this, you will soon get into the way: lift pinion out, and turn on a tooth—two or three, perhaps; then refix, and all will be right. Now pin up and replace pallets, unless visible ones; fix on face wheels—one screws on, you will find, and in the trade we have a wooden support to place the movement in; to try it, you can easily fit one up, no matter how rude, almost like an old-fashioned candlestick, with a notch cut to hold outer plate. After trying a day or two, place in marble case, with screws; and now, before screwing up, set case level and turn front of movement, twelve o'clock exactly on top: listen to tick—if equal, all right; if not, just turn a little either way; if twelve o'clock is too much out of place, bend the crutch a little at back, and all is right time for a week or so.

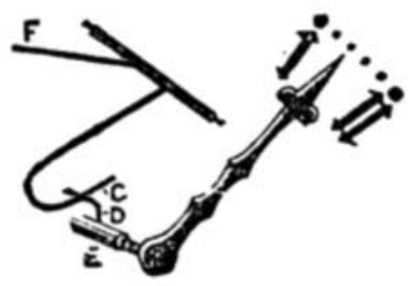

Fig. 4.—Lifting and Stop Lever.

OUR GUIDE TO GOOD THINGS.

**** Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of WORK for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of any one who has a useful article for sale to obtain mention of it in this department of WORK without charge, the notices given partake in no way of the nature of advertisements.*

107.—New Fluid Waterproof Glue.

The Waterproof Glue Company, whose head office, readers of Work are requested to note, is 62, Dale Street, Liverpool, where all communications and orders should be addressed, have recently brought under my notice, for the second time, samples of their new Fluid Waterproof Glue, which is now put up for sale in a novel and most convenient form. The glue has now been before the public for some time, and, to judge from the testimonials that have been received from various sources, has been found to be a thoroughly reliable article. The tins in which it is now sent out—at 6d. or 1s. per tin, according to size, at most ironmongers', or 8d. and 1s. 3d., if sent by post—are cone-shaped, and have a spring bottom like a small oil can. The hole in the top of the cone, which forms a means of exit for the glue, is stopped with a pin, whose head is soldered to the tin with a soft composition, which can be easily removed with a knife, to allow of the withdrawal of the pin, which must be replaced as soon as sufficient glue has been pressed out of the tin. The great recommendation to this mode of putting up glue is the facility with which the operation of gluing can be effected without heating or any trouble whatever, no brush being necessary, and the shape of the vessel admitting of the exact quantity required being put with precision on the place at which it is wanted. After the glue is set, it will bear prolonged exposure to damp, or actual immersion in water, for a lengthened period of time without impairing in the slightest degree the adhesive power and qualities of the glue. All workmen who, in their various avocations, are obliged to make use of glue, either at home or in the workshop, should give this glue a trial. It is perfectly reliable in its effects, cleanly to use, and truly economical, because it can be used without the slightest waste, or any of the danger that has been known to arise from the overboiling of glue in the ordinary glue-pot.

108.—Britannia Company's Buyers' Guide to Technical Books.

The Britannia Company, Colchester, and 100, Houndsditch, London, E.C., have just issued a pamphlet, under the title of "The Britannia Company's Buyers' Guide to Technical Books in the Mechanical Arts," containing the best British and American books, fully described, showing price, size, and contents of each. The books mentioned therein are classified under various heads, namely, Appliances and Processes; Applied Mechanics; Building, etc.; Carpentry, Joinery, etc.; Coach Building; Drawing, and Instruments Used; Electricity; Electrometallurgy; Fretwork and Carving; Gas Engineering; Machinery; Materials; Metallurgy; Painting and Decorating; Pattern-making,

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Moulding, and Founding; Plumbing; Reference Books; Sheet-metal Working; Steam, Boilers and Engines; Turning, Screw-cutting, etc.; Watches, Clocks, and Jewellery. An index to authors' names, and another to titles of books, are added at the end of the pamphlet, the price of which is 6d.

109.—OUSELEY'S FIREPROOF PAINT.

I have been asked to supplement my remarks on this fireproof paint by stating that arrangements have been made by Mr. Ouseley for its sole manufacture and sale by the "Anti-Flamma" Fire-proofing Company, 52, Queen Victoria Street, London, E.C. This company have been recently awarded a silver medal at the Edinburgh Exhibition for this paint.

SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

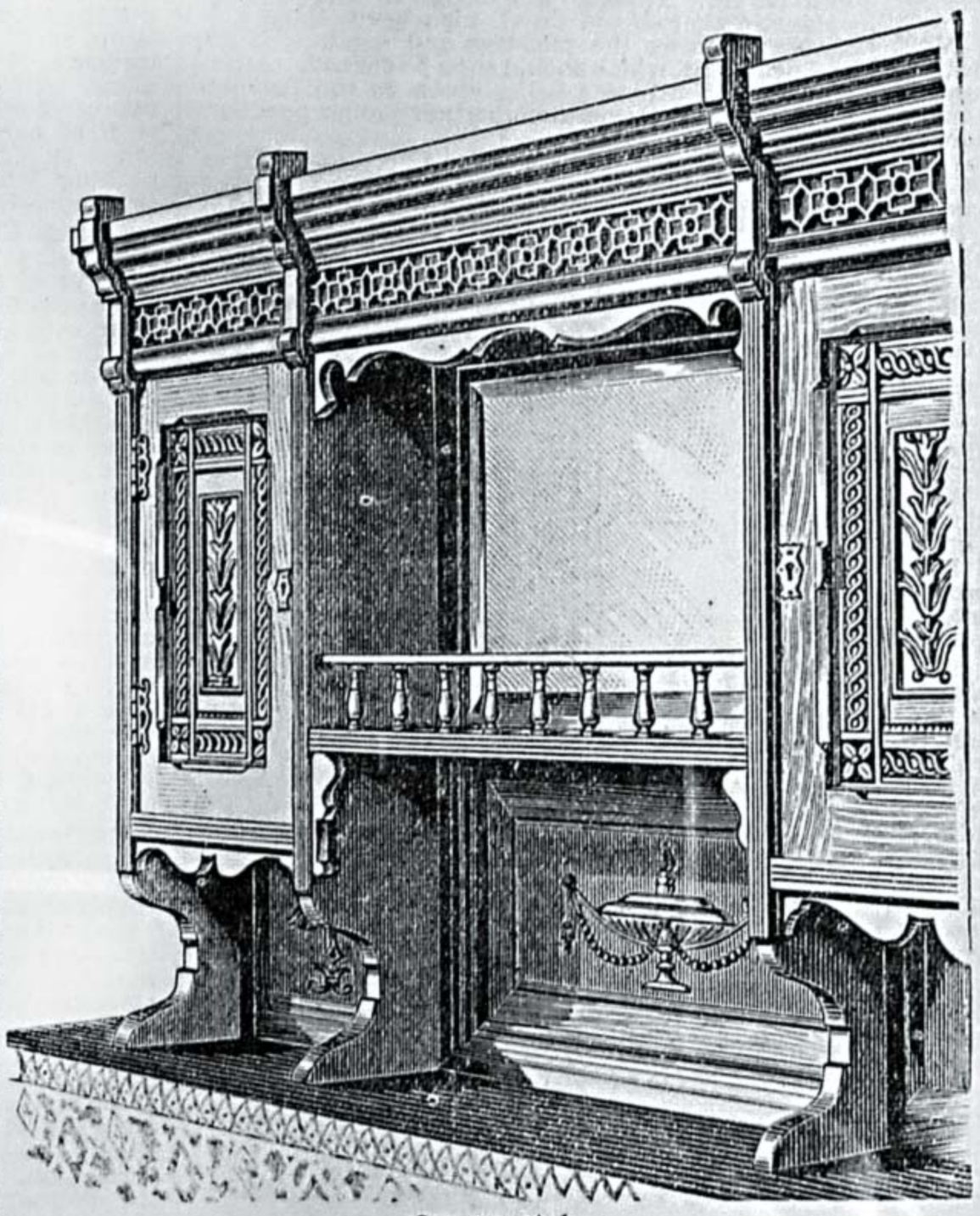
*** *In consequence of the great pressure upon the "Shop" columns of* WORK, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—LETTERS FROM CORRESPONDENTS.

Champion Incubator.—B. A. B. (*Hampstead*) writes, in reference to this Incubator, which was noticed in "Our Guide to Good Things," page 153:—"The prices of the 'Champion Incubator' are: No. 1, the smallest, fitted with paraffin lamp, drawer thermometer, tank thermometer, funnel, one extra lamp chimney, one yard of wick, and egg testers for three sizes of eggs, a copy of Hearson's handbook (full of instructive details), pieces of canvas for the water tray and egg drawer; inside measure of egg drawer, 7 in. by 7 in., will hold thirteen hen or eighteen pheasant eggs; complete with copper tank, £2 15s.; with galvanised iron tank, £2 10s. No. 2, with above requisites, size of egg drawer, 10 in. by 10 in., will hold twenty-five hen or forty-two pheasant eggs; complete with copper tank, £4 7s. 6d.; with galvanised iron tank, £4."

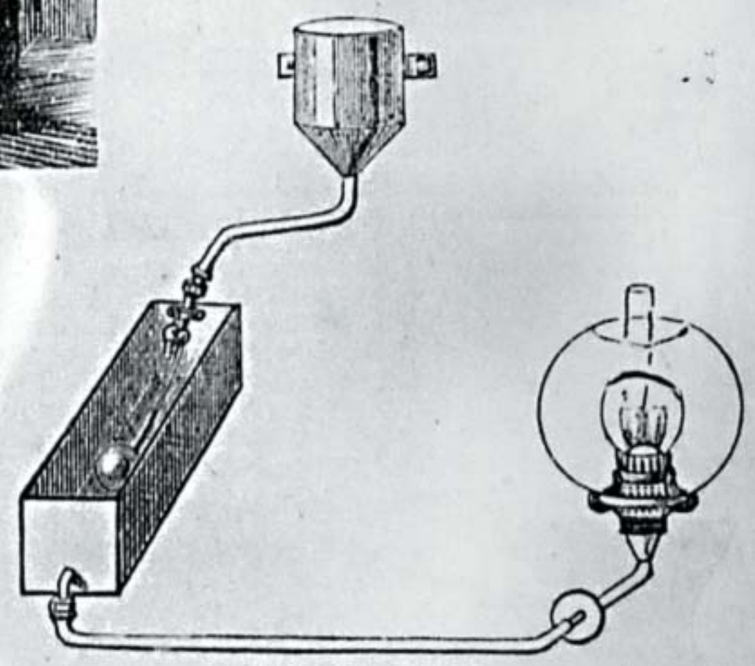
Overmantel.—J. M. S. (*Addiscombe*) writes:—"Enclosed herewith I send you a photo of an overmantel I have made from the drawings and description given in Vol. I. It is taken in a rather peculiar light, and hardly does justice to the work. You will observe that in many details I have departed from your drawings: for instance, the fronts of each of the uprights, the end pieces, and the edge of the end brackets are beaded, the beading being done with a router made by myself from the instructions given in one of the numbers of Vol. I.; the frieze, instead of being of plain wood with small fillets glued on underneath the moulding, is covered with linerusta walton; the panels of the doors, and also those beneath the cupboards, and the centre shelf are covered with the same material. My way of fitting the lower panels is, I think, an improvement on anything I have seen recommended in WORK. I took a piece of ¾-in. deal, 2 in. wide, and of a length corresponding to the length of the overmantel, measuring from the inside of one end upright to the inside of the other. I then cut a piece ¾ in. deep and 2 in. wide out of the bottom of each of the two middle uprights, and into the space thus left the piece of deal was fitted, being fastened with two screws through the deal up into each of the middle uprights, and a long screw being put through each of the end uprights into the ends of the deal. The edge of the deal facing to the front was beaded to correspond to the other beading on the front of the overmantel. On the solid foundation thus laid a small moulding was put round to hold the panels in. Mirrors could be fitted into the spaces thus formed equally well, and the whole arrangement is safer, stronger, and more sightly than the tin or iron clips I think I saw recommended in the columns of 'Shop.' I may mention that the small moulding is not brought up flush with the front edge of the piece of deal, but a space of about ¼ in. is left, thus giving the whole



Overmantel.

succeeded pretty well. Each of the panels in the photo is made up of eight or nine pieces fitted together. The space over the middle shelf is filled with a bevelled plate-glass mirror, and the cupboards have backs to them. I am very much obliged to Mr. Adamson for his clear and explicit instructions and drawings, and I should be very glad to have his criticisms on my work. This is the first job of such a magnitude I have done, and I do not think I should have attempted it, if it had not been for his articles on artistic furniture. I have tried to do everything as well as possible, and I have not wasted a single piece of wood over the job by bad work."—[You ask me to criticise your work as described in your letter, and shown in photograph, but I really don't know what to say about it in a critical spirit, if by this is meant suggestions on points which might have been done better. Without actually seeing the overmantel, as I hope I may have an opportunity of doing at the forthcoming WORK Exhibition, I cannot say that there are, from your letter, any objectionable points in it. There cannot be the slightest doubt about your having got up a very much handsomer piece of furniture than the very plain one which was the subject of the description from which I am glad to hear you derived so much assistance. You have, in fact, done what it could be wished more of our readers would do—viz., engrafted your own ideas on the practical instruction given. If everyone would take the pains you have, there is no reason why the design of any piece of furniture which has been described in WORK should not be so altered by the maker as to be virtually a new one. It must be patent to all that this is far more satisfactory and better calculated to develop skill and artistic taste than mere slavish copying. Of course it is easy to read between the lines that you had acquired a fair amount of skill before you tackled the overmantel, even though it is, as you say, the largest job you have attempted. Your construction of the door frames is, of course, much better than if they had been halved, a method only mentioned as less troublesome for novices. Your method of fitting the lower panels is right enough, and, as you suggest, glass might have been used. In conclusion I congratulate you on your success. I understand the photograph is to be engraved in the hope that it may encourage others to send in such friendly tokens of their appreciation of WORK.—D. A.]

A Self-Acting Paraffin Lamp.—TINMAN writes:—"Enclosed is a sketch of a self-acting paraffin lamp of my own make, which I have had in use about four months, and has never failed to act. It saves the trouble of filling each night, which has to be done in the ordinary lamps, and safe because the bulk of the oil can be put any distance away from the flame; and again, most paraffin lamp accidents are caused by people carrying lamps and letting them fall, or else with them being knocked off tables, etc. Now, this lamp is fixed against a wall on a gas bracket (one with as few joints as possible), and therefore cannot be carried about. The principle of it is just the same as a closet cistern, and can be made to burn a week, a fortnight, or a month or two without filling again with oil. I will now explain how it is made: first, you must have two tanks, one an oblong and the other either round or square; if a round one is used, it is best to put a lantern flue cone on for a bottom so that the oil will flow to one place—of course by this tank you have your week or fortnight's supply, and must make it accordingly. Now the next thing is to get a ball-cock; you will have to cut the rod of it so that it will go in the oblong tank, then solder a piece of strong tin on one end to solder the ball-cock on to, then connect the other tank to it by means of a piece of ¼-in. compo pipe, and be sure to keep it higher than the top of the other tank; then take the rubber washer out of the ball-cock and put a leather one in, because the oil swells the rubber so much that it won't act; now fill the round tank, and see what depth of oil it takes in the oblong tank to close the ball-cock. Suppose the said tank is on a shelf 5 ft. above the ground, and it takes 2 in. depth to close the ball-cock, you would want the collar of the burner 5 ft. 2½ in. from the ground; next punch a ⅜-in. hole in the tank near the bottom, and solder a ⅜-in. elbow union over the hole; then connect a piece of ⅜-in. compo. pipe to it and to the bracket, remembering to use a drop screw in connecting with the bracket. The next thing wanted will be a brass cup to fit the collar of the burner and the top of the bracket—for my lamp I have one of Postlethwaite's burners, 50 candle-power, which I consider the best burner in the market. In screwing up all connections use a gascon and red lead, and don't put oil in for a day or two, so as to allow



Paraffin Lamp.

the lead to set. It is well known that liquid always finds its level; it is the same in this lamp: the burner and the surface of oil in the oblong tank are level; as the burner burns the oil out of the said tank the ball drops, opens the cock, and the oil runs in from the round tank, and keeps it on a level with the burner."

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Phonograph.—SPECTACLE.—(1) Lay the tinfoil out flat upon a sheet of glass, and rub it carefully with a pad of cotton-wool from end to end. This will make it quite smooth. (2) Thin skin parchment can be obtained at any stationer's shop. (3) Two needles are not absolutely necessary, for some forms have only one needle. Their shape varies according to the ideas of the makers; some are made chisel-shaped at the point. In Edison's instrument, where two are employed, the one is bell-shaped and the

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other cup-shaped. They are fixed in a carrier, which is fastened to the soles, or uprights in some cases. This carrier is made adjustable by a screw arrangement. (4) Sufficient pressure to produce the desired result, which can only be determined by experiment. The pressure is regulated by the screws. (5) The motor must turn the cylinder at a uniform rate if the best results are to be obtained. But the needle would describe a spiral on the cylinder whether or not, as the screw on the cylinder is a spiral.—W. D.

Bricks.—P. J. C. (*Balbriggan*).—As the thickness of bricks varies in different localities, it is difficult to give you an accurate reply. However, if the bricks set 3 in., the number required will be 4,800. If they set 2¾ in., 5,200 will be required. Another matter to take into account is whether the wall is faced on both sides, or on one only; if faced on both sides, two-thirds of the bricks must be good hard bricks, and out of ordinary stocks you would hardly get that quantity, so that you should have a larger quantity than is named, unless the bricks are uniformly hard and well shaped; for one face you would be able to get sufficient from the quantity named. If there are any openings, such as doorways, windows, etc., in the wall, deduct 100 for every superficial yard of openings; this is less than the quantity, but you will require a few extra for cutting.—M.

Bicarbonate of Potash Battery.—C. McC. (*Bangor*).—Place a porous cell in an old tin can, and pack the space between the inside of the can and the cell with iron borings. Fill up with a concentrated solution of American potash (crude bicarbonate of potash), and suspend a piece of zinc from a bung on the porous cell in the potash solution, to form the positive element of the battery. Solder a wire to the tin can, which in itself forms the negative element of the cell. The current from three cells of this battery will ring an electric bell, but the solution needs frequent renewal to keep the cells in working order. If you mean a bichromate of potash battery, you will find an account of one in Vol I. of WORK, page 442.—G. E. B.

Picture Framing.—G. B. (*Accrington*).—Strain your glue through muslin, so as to extract any particle of grit, damp your picture, and glue it on to a piece of card larger than your picture; lay under a press of card or any weight near at hand. When dry, which does not take long, take your picture, lay mount on, and with a paper-knife mark round opening of mount; then glue the edge of card thinly up to indent line, and place your mount over, rubbing round with strip of paper; not to soil mount, put press on again for about an hour, when your picture is ready for framing.—G. C. R.

Tubes for Engine.—M. T. W. (*Warbleton*).—The brass tubes (A, Fig. 1) are driven hard into their drilled holes in the tube-plates B with a mandrel like tool C, which sends them in without bruising the edges, as a hammer would do. When in position, they are expanded to render them perfectly watertight in their tube plates. A tube expander, of which there are several kinds in the market (Dudgeon's being one of the best known), is used. This is inserted into the open ends of the tubes, and then a handle is rotated and pressure applied at the same time. A tapered centre piece thus presses

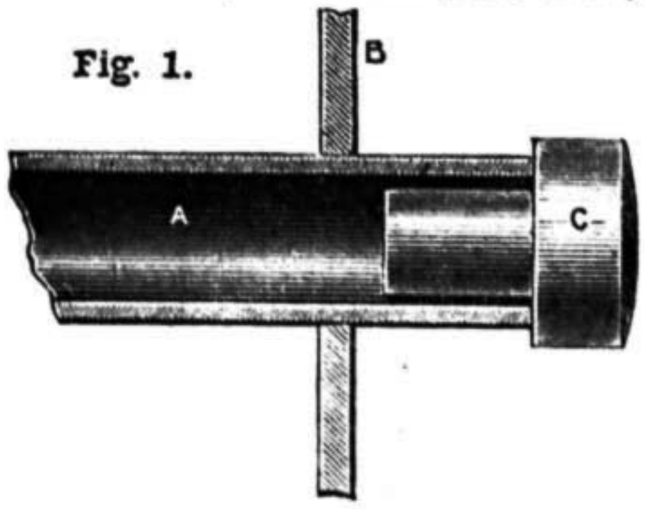

Fig. 2.

Tubes for Engine.

loose rollers outwards against the bore of the tube tightening it in the tube-plate. That end of the tube that protrudes within the fire-box is then rounded or "beaded" over with a hammer first, and beading tool afterwards, the latter having the appearance of Fig. 2, D. The tool is struck with a hammer, and the whole circumference of the end is gone over in detail, thus giving a very neat rounding finish. This serves to rivet the end over, and also affords a better protection against the action of the fire than the keen edges of square ends would give.—J.

Mill Picks.—A BLACKSMITH.—Heat a bath of lead to the boiling point. Plunge the end of the pick to about a length of 1½ in. in it, until heated to the temperature of the lead, and then plunge into cold water; or heat to a cherry red, and plunge into a bath of 2 gallons of rain-water, 1 oz. of corrosive sublimate, 1 oz. of sal-ammoniac, 1 oz. of saltpetre, and 1½ pints of rock salt.—J.

Mould.—G. F. (*Baxmaur*).—By "mould," you evidently mean a pattern from which to mould. A sheet of lead is what you require, or failing that, a sheet of gutta-percha. You can bend these into any required shape, and a moulder can cast from them. If you want a small quantity of steel, a smith could hammer you down a bit. Would a piece of an old saw-blade answer your purpose? You could temper to liking. I daresay Pfiel & Co., Clerkenwell, could supply a large quantity.—J.

Carved Oak Mirror Frame.—SUNEV.—The sketch annexed is, I think, what you want, 5 ft. 6 in. over the cornice, and 5 ft. high to the top of the pediment. I have made it of heavy, massive proportions, which I hope is right; but if not, the breadth of the pilaster and depth of cornice may readily be reduced, thereby allowing a larger mirror to be used, and making the whole lighter in appearance. You speak of getting your mantel mirror made by a cabinet-maker, and then carved by a local carver. To make this design in this way, the cabinet-maker should do all his work without permanently fixing the pilasters and capitals, frieze and pediment, which should then be carved. Afterwards, all the pieces being given to the cabinet-maker, he will fasten them in their proper positions

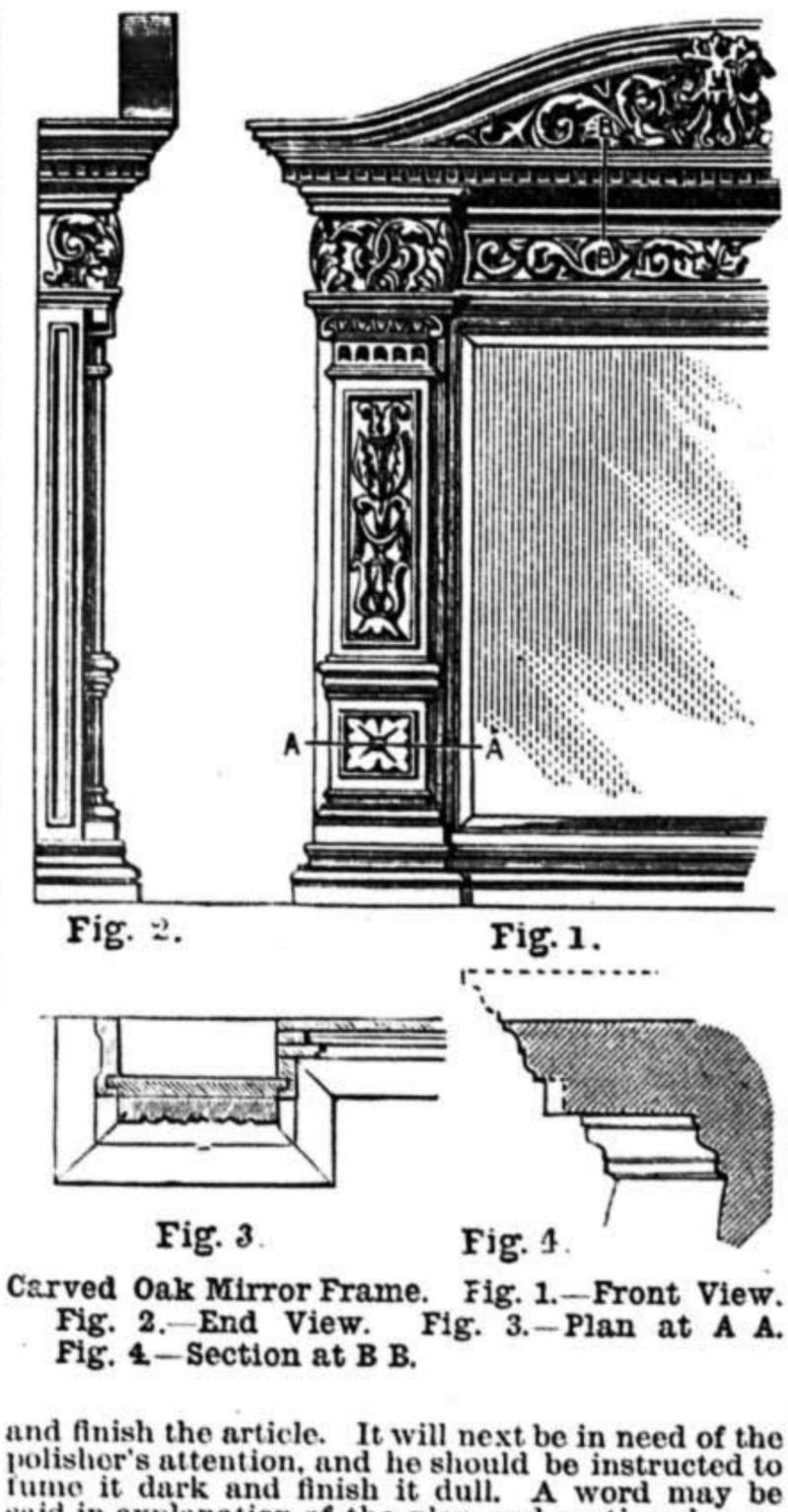

Fig. 2. Fig. 1.

Fig. 3. Fig. 4.

Carved Oak Mirror Frame. Fig. 1.—Front View. Fig. 2.—End View. Fig. 3.—Plan at A A. Fig. 4.—Section at B B.

and finish the article. It will next be in need of the polisher's attention, and he should be instructed to fume it dark and finish it dull. A word may be said in explanation of the plan and section shown. Fig. 3 gives in the hatched part, the section through the pilaster at A A, showing it boxed up first, and with a board planted on its face. The outer lines show the base mouldings. In Fig. 4 is given the cornice mouldings, and the portion returned round the pilaster is also shown. The dotted portion above the hatched part indicates the topmost members of the curved moulding forming the pediment, and which topmost members project right over the straight cornice at each end. The carved mask or face in centre of pediment is intended to lie well forward in front of the mouldings which run behind it, and the carving on each side and under it should be bold and well relieved. The other carvings might all be in low relief.—A. M.

Frames.—C. N. B. (*Guildford*).—I have given your inquiry to one of the best and cheapest houses in London, and they promise to write you and send samples free of charge. If they do not suit you, try Shultz & Co., Long Lane (next Aldersgate Street Station).—G. R.

Bevel Mounts.—CONSTANT READER.—There is no machine used amongst professional mount cutters; there is a special knife make, harpoon shape, which has to be kept as keen as a razor to ensure success. A steady hand and a little practice soon helps to acquire the knack. You can get mount-cutters' blades and handles at any first-class tool makers.—G. C. R.

Nickel-Plating.—JAY DEE.—The replies given to J. C. J. (*Hepworth*) on page 551, Vol. II., and to M. R. (*Huddersfield*) on page 552, Vol. II., will answer most of your questions. A dynamo is preferable to a battery for working large bulks of nickel solutions.—G. E. B.

Electric Light Installation.—HIGH PEAK.—An electric light installation to replace two double-wick paraffin lamps should consist of the following:—

	£	s.	d.
One shunt-wound dynamo of 50 c.p.; cost about	5	0	0
Five 8 c.p. incandescent bottom-loop lamps, at 3s. 9d. each		18	9
Five cheap pattern bottom-loop lamp holders, at 1s. each		5	0
One main-line switch to turn on current from dynamo		3	6
Five "Shop" lamp brackets, at 2s. each ...		10	0
Twenty yards main line 7-strand No. 20 cable, at 3½d. per yard		5	10
Twenty yards No. 20 insulated wire for branches, at 1½d. per yard		2	1
Total for material ...	7	5	2

This will not provide a switch for each lamp, nor a safety fuse cut-out. If you desire a switch for each lamp, so as to be able to turn on one or more at pleasure, it will cost you about 1s. 6d. per lamp extra. A safety fuse cut-out will be most desirable to protect the lamps from injury in case of a sudden rush of current from the dynamo: this will cost about 2s. 6d. more. As you can have power for nothing, I have omitted the cost of motor in my estimate.—G. E. B.

Cheap Bichromate Battery.—F. P. (*Lower Broughton*).—Get two plates of gas carbon, each 5 in. by 2½ in. by ¼ in., and one zinc plate of the same size, but of only ⅛ in. thickness; coat the zinc plate with quicksilver, as directed in the article on the Bunsen battery in No. 1 of WORK. Select a jam or salt jar, or a wide-mouthed pickle-bottle, large and deep enough to hold these plates. Get two thin strips of wood long enough to rest on the edges of the jar, and clamp the zinc plate tightly between them, with about ½ in. of the plate projecting above the wood. Two screws through the ends will cause them to clip the zinc tight. Drill two holes near the corners at one end of each carbon plate, and hang the carbons by two pieces of copper wire across the zinc on each side when this is placed in the jar. Get a clamp to fit on the zinc to hold a conducting wire. One of the wires connecting the carbons may be left long enough to form a connecting wire for these. Place a bit of slit rubber tube under each wire to insulate them from the zinc plate. Charge the battery with 3 oz. of bichromate of potash dissolved in one pint of hot water, and then made acid with 3 oz. of sulphuric acid.—G. E. B.

Registration *versus* Patenting.—INDUSTRIA.—Registration will protect shape or pattern only; if any novel principle or process of construction is involved it must be protected by a patent. By registration, INDUSTRIA can prevent anyone from imitating the mere pattern of his chair-table, but not from making or selling chair-tables on his principle, so long as they differ from his pattern.—C. C. C.

Wooden Medicine Chest.—PHYSIC.—Medicine chests are made in a variety of patterns, none possessing any good looks. The one I here illustrate should suit you. I have not adhered strictly to any prescribed dimensions—use your judgment thereupon. You may have an additional shelf at the bottom by simply reversing all upper parts. You can also cut back-shaped pieces and cupboard backboard all in one piece; or have the latter in

Medicine Chest and Parts.

one piece and the shaped parts separately. Screw them to back edges of sides and shelves. Join shelves to sides, as in Fig. 4. The mortice and tenon in Fig. 3 will be strong enough. Fig. 2 shows one corner of a door (back view) rebated to receive panel, which should be nailed in position. For appearance' sake, glue one-half (lengthways) of a small bead to *one* door only (A and B respectively, Fig. 5). If you have shelves same width as I show, any large bottles can conveniently stand upon cupboard top.—J. S.

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Working a Patent.—E. R. (*Salford*).—There are agents who serve as middle-men between patentees and manufacturers who (when inventions have a commercial value) arrange sales and working on royalty. Apply to one of these. But there is no reason why you should employ an agent. You can learn what respectable firms would be likely to take it; and if doubtful as to its value, see what offers they are inclined to make.—C. C. C.

Picture-Moulding Dealers.—G. A. D. (*Bradford*).—The following addresses may serve you:—Shultz & Co., Long Lane (next to Aldersgate Street Station), E.C., and at Cologne, Germany; Köhmmann, Australian Avenue, Jewin Street, E.C.; City Frame Company, 29, Basinghall Street, E.C., and Hamburg and Berlin, Germany.—G. R.

Willesden Paper.—A. E. (*Dalston, N.E.*).—You can buy any quantity of a retail vendor, but wholesale only in the piece. You cannot do better than use good Scotch glue for sticking together.—G. R.

Re-Silvering Jewellery.—TYRO.—To re-silver jewellery, you would require battery, silver plate (pure), and silver bath; cost about £2: but to whiten up and make old stock look like new, pickling in a sulphuric bath and scratching with soft wire scratch-brush, then washing with plenty of soap and hot water, and dry in warm sawdust (boxwood), is the process. See there is no soft solder on any part, or that the article is not put together with it; take out the stems and pins, then lay them one at a time on a lump of pumice-stone or charcoal, gently apply heat by blowpipe till a dull red, let cool, then drop them in a solution or bath of water nine parts, sulphuric acid (oil of vitriol) one part; the water may be cold or hot (not boiling). I prefer hot, as it acts quicker; let them remain till a dull or dead white, then remove and gently scratch them with a circular scratch-brush on a lathe, if you have one; if not, a hand scratch-brush will do, using plenty of stale beer or ale on it, then wash in hot soda-water and soap, and dry in warm dust. The dust and brushes may be got from the tool dealers, say Grimshaw & Co., 35, Goswell Road, Clerkenwell, E.C.; Haswell & Sons, 49, Spencer Street, Clerkenwell, or others. If the colour is not satisfactory the first time, repeat the process; any bright parts may be touched up with the burnisher, using a little ale to keep moist; extra dull parts required, simply wash and dry. To warm the dust, use an old frying-pan.—A. B. C.

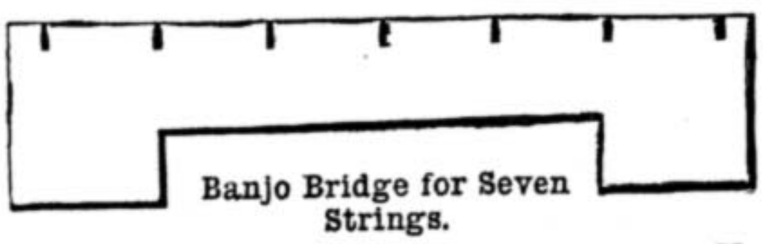
Mount-Cutting Tool.—T. H. (*Walsall*).—You can buy a mount-cutter's blade of any first-class tool-maker; it is a long steel blade, usually 6 in. to 8 in. long, and costs 1s.; the handle is made of hard boxwood, with brass screw so as to move blade at will for sharpening, etc., and costs 3s. 6d. A steady hand and practice is the only necessity to become perfect.—G. C. R.

Picture Frame.—LIVERPOOL.—Tools required—cutting-block, tenon-saw, shooting-board, plane, vice, bradawls, hammer. You may possess some of above; the balance at any respectable tool-maker's. I do not give addresses, as every town has many, and to get them from London makers is costly. How to get your mitre up, see Vol. I., page 637, "Shop."—G. C. R.

Picture Framing.—THEO.—There is no book published that gives practical information upon this subject. There was about two years ago an attempt to start a paper for this trade, but it fell through for want of support.—G. R.

Beginning WORK.—G. R. (*Edinburgh*).—There are fifty-two numbers in a volume of WORK, so if you purchase the current number you can easily determine for yourself when Vol. III. will begin. But why wait to begin? My advice to you is to start at once, for every part and every number is complete in itself to a certain extent as far as treatment of a subject, or parts of a subject, is concerned, and you would then be induced, in all probability, to buy up all the back parts or numbers prior to that with which you commenced. Each weekly number is published on Wednesday, though it is dated for the Saturday following. The part for each month is published on or about the 25th of the preceding month. Thus the part dated February, 1891, is published on January 25th or thereabouts.—ED.

Banjo Bridge.—F. J. P. (*West Bromwich*).—Ebony is not a suitable wood for bridges. Use sycamore, maple, or cedar. I have given a sketch of the size I generally use for seven strings. Measurements can be taken from sketch for five or six string bridges. Some players might prefer a wider or narrower bridge, as the case may be: those having thick finger tips requiring a bridge wider



Banjo Bridge for Seven Strings.

than those who have slim taper fingers. You should make two or three different widths and see which suits you best; and having made one to your liking, whenever you require a new bridge you can mark the exact size from old one. I will attend to your suggestion for an article on "How to Keep the Banjo in Order" at an early date.—J. G. W.

A Writing Table, with Reversible Flap.—A. E. S. (*Maidstone*).—This original writing table design has a resemblance to my toilette and writing table (see pages 400 and 401, No. 78, Vol. II.), and I refer you to that for a plan. The legs, backboard, and four sideboards will be the same as there shown, or dovetail-morticed and tenoned, excepting that the top is intended to be divided into three equal parts, 12 in. each (3 ft.). The principal feature is the reversible middle flap, elevations of which are shown in Figs. 3 and 4, in both of which A is a stationery box; B is the front-shaped piece (Fig. 2) joined to reversible board, and to both of which are joined two ¼-in. boards, 12 in. long and 8 in. wide, and two 8¼in. long and 2½ in. wide, with a division down the middle. A lid will be required as C in section Fig. 5. This flap is pivoted in the middle at each side to the inner edges of the other two top boards. To accomplish this, first drill the holes in the respective edges; then drop the pivots into those of the reversible flap, and drill holes from its surface (Figs. 6 and 7) to enable the pivots to be pushed through the holes in the side top boards. To thus fix it and make all right, drive pieces of wood into the surface holes, and fill them completely up (Fig. 7). Join a board, 3 in. or 4 in. wide, to the table top to retain the reversible flap in

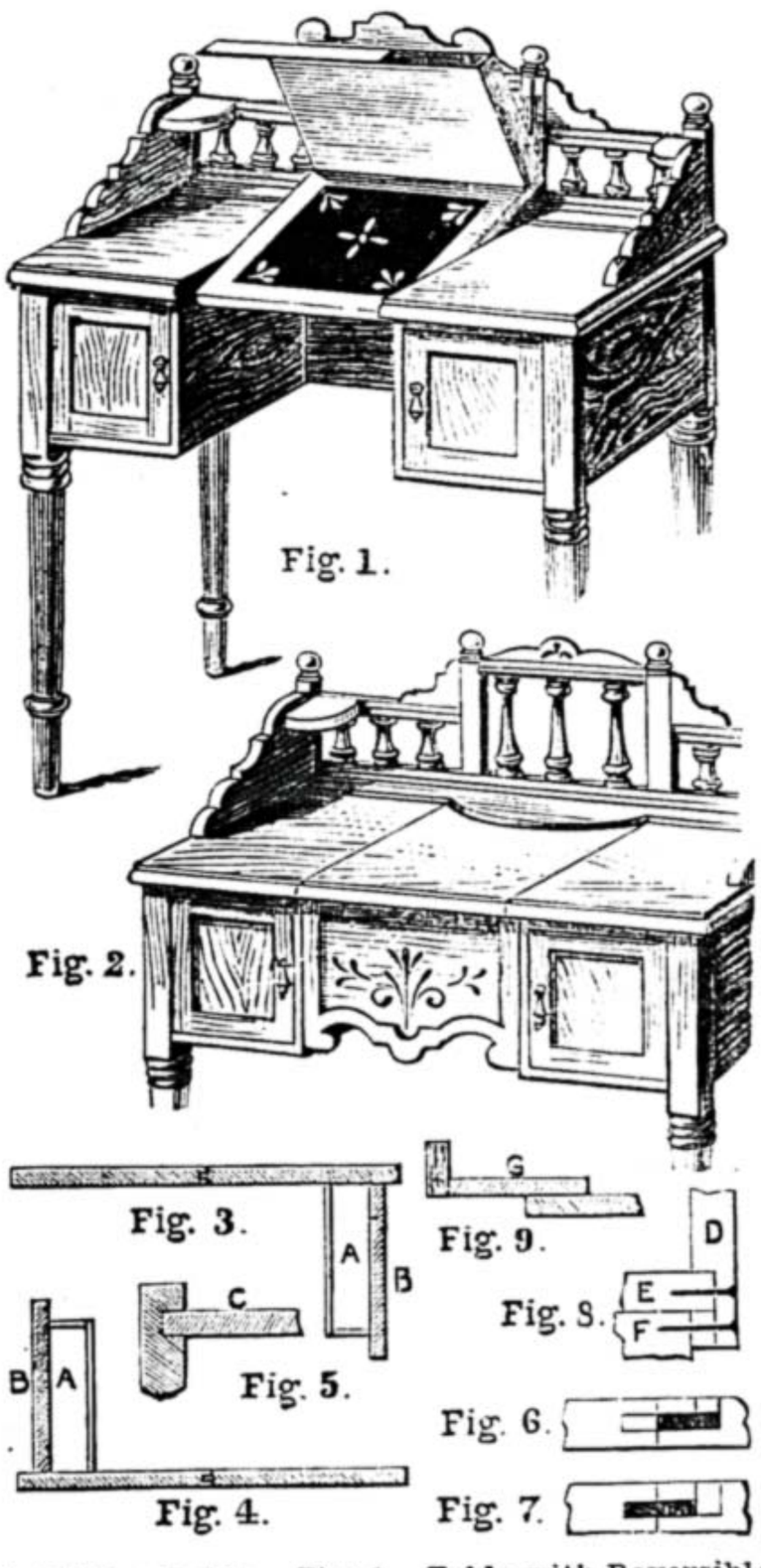


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 9.

Fig. 8.

Fig. 6.

Fig. 7.

A Writing Table. Fig. 1.—Table with Reversible Flap adjusted. Fig. 2.—With Reversible Flap closed. Figs. 3 and 4.—Flap as in Figs. 2 and 1 respectively. Fig. 5.—C, Lid covering Stationery Box. Figs. 6 and 7.—Diagrams showing how to insert Pivots in Flap, etc. Fig. 8.—Diagram showing how to join Back Parts to Table—D, Side View of Back Parts; E, Table Top; F, Side of Table, with small Length of Wood running between the Rabbet of Back Parts and Table Carcase. Fig. 9.—Board to retain Flap as in Fig. 2.

position. To use, the front end (A and B, Fig. 3) is brought up and over, and a couple of flush bolts in the edges (previously fitted, of course) shot into the inner sideboards to keep it firm. There will be space enough in the cupboards for inkpot, etc. The back pieces can be fitted as shown in Fig. 8. Distance from back to front of table top, 18 in. Length of flap, 16 in. Legs, 27 in. long, 1½ in. thick. Doors, 10 in. square. Thickness of sideboards, etc., ¾ in.—J. S.

Picture Oval Cutting.—T. T. (*Liverpool*).—For a round opening or circle, the compass would soon mark it out, and if it is wood a fret saw would cut it, or if of cord, a mount-cutters' knife. If T. T. requires to strike out a true oval to any given measurement, see "Shop," page 652, Vol. I.—G. C. R.

Boomerang.—QUERIST.—A boomerang is a missile made of hard wood, invented by the aborigines of Australia. It is not easy to give you a correct idea of its form and proportions on paper, but you may gather some idea of it from the annexed sketch, together with the following short description. For amusement, any light wood capable of being carved may be used. For more serious purposes a hard dense wood must be employed. The length may be from a foot to 18 in. or more; the width at the widest part may be from 3 in. to 5 in. Success depends more upon the shape than upon the size. Its contour follows that of a bird's wing when closed, being convex on one side and concave on the other. The right convexity of one side and the concavity of the other varies with the wood employed, and is found by experiment, the wood being whittled away until the missile achieves its desired mission. It is thrown from the right hand in a horizontal direction, with the concave side upward. The knack of throwing properly is learnt by practice.—G. E. B.

Boomerang.

Melting Indiarubber for Moulding.—J. W. P. (*Chelmsford*).—A compound of indiarubber and sulphur in varying proportions is generally used. Almost anything which will take and retain the requisite shape, and bear being heated to a temperature of 400°F., will suffice for a mould. State more definitely what description of articles you wish to mould.—QUI VIVE.

Cards.—W. B. (*Sowood*).—You will get all kinds of plain and fancy cards from Messrs. Dobbs, Kidd, and Co., Fleet Street, London, E.C.

Violin Varnish, etc.—AMATEUR.—Without knowing what gums and their proportions are in your varnish, I could not say what effect will be produced. If you make the bass bar 10½ in. long, ⅝ in. thick, and ½ in. deep in the middle, it may remedy the fault you complain of. The thickness of the belly is about right, if anything a shade too thin.—B.

III.—QUESTIONS SUBMITTED TO CORRESPONDENTS.

Silvering.—ALBO writes:—"Could any of your readers inform me of the process of silvering aneroid dials, etc., known as 'French silvering'? It is used chiefly on engraved or raised surfaces, and gives a more dead-white appearance than the ordinary chloride of silver process. It is not put on with battery power, I believe. Also, the best kind of varnish to use."

Doll's House.—J. W. (*Sheffield*) writes:—"I should feel greatly obliged for a good design or designs of a doll's house, with brief details as to how to make one."

Etching Acids.—ETCHER writes:—"I much want the name of an acid (or mixture of acids) suitable for etching copper plates that does not fume the same as nitric or nitrous acids do."

Diving Tools.—T. J. J. (*Tottenham*) writes:—"I shall feel greatly obliged to any reader who will give me sketches and sizes of the tools used by divers, I mean those using the diving dress."

Wood-Carving Designs.—J. J. (*Orkney*) writes:—"I would be glad if some correspondent would let me know where I could get designs of wood carving—not paper designs. I would like the design carved out on wood to copy from."

Moulding Making.—CORNICE writes:—"Will any of your numerous readers enlighten me as to the process of making gilt mouldings? I mean in particular with regard to the transfer of the pattern to the composition which is used to cover the ordinary wood foundation. Whether it is effected by means of a circular or flat mould, and how? I am anxious to make some cornice work."

Brick and Marble Tesseræ.—R. E. (*Kensington*) writes:—"Perhaps some of your numerous correspondents may be able to tell me where I can get the small half-inch brick tesseræ—both red and yellow—which are so extensively used in the laying of mosaic work. Also if I can buy marble tesseræ already prepared for laying, and if so, where?"

Shut-Up Grinding Machine.—T. E. W. (*Hull*) writes:—"I have seen a man going about the streets with a small machine under his arm scissor-grinding; it was about 3 ft. high, and the back legs shut up with hinges to the front; it had a small fly-wheel, treadle, and small emery and stone-grinding wheels. Could you oblige by telling me how to make one that size, so it could be put away, and take up little room? I want it to cost as little as possible."

Dovetailing.—T. E. W. (*Hull*) writes:—"Could any reader tell me how to make a simple dovetail, and the way to mark it out before cutting? I do not know much of joinery."

Small Metal Soldiers—the Flat Ones, not the Thick Ones.—L. A. C. (*Wigan*) writes:—"I shall be glad of information upon the following points:—(1) How are the above made—are they stamped with dies or cast in moulds? (2) Is the making of the dies or moulds within the reach of an amateur, or does it require special tools? (3) If not, where can I get them made, and what will be about the cost? (4) What alloy is used? (5) What kind of paint is used to colour them?"

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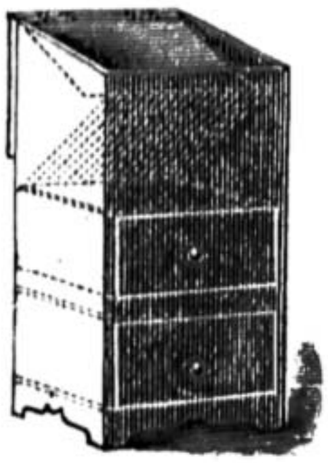
Pyrogravure. — JABEZ writes: — "Will any reader kindly give me a description of the process of burning designs in on leather known as pyrogravure? Also, where is it in operation, as I should like to see it?"

Axle Oil.—J. H. E. (*Shepherd's Bush*) writes:—"I should be obliged if any reader would inform me how to prevent the oil working from the axle into the spokes of mail-cart wheels, and thus causing them to work loose and come out. The holes have been wrongly drilled right through to centre of hub. I have had two pairs of wheels come to pieces this last season."

Pipe Making.—SOUTH WALES writes:—"I respectfully ask if you know of a machine in the market for the manufacture of pipes. It is used in connection with spelter furnaces, and is fixed in the mouth of the retort to receive the metal, and is made out of fireclay. It is manufactured as follows:—First, the clay is made into a ball shape of about seven pounds in weight, then, after being well sanded, it is put into an iron mould; this mould is fixed into a cast-iron mould, which is stationary, to keep it from moving; then a setter is driven into the ball of clay by a man working it up and down like a steam hammer until it is quite home, then the sheet-iron mould is pulled out and the pipe taken out and fixed on its end and left there until it is sufficiently dry to be removed. A man will make 150 of these in a day, but the work is very arduous, and the process of making is absolutely unworthy of the nineteenth century. If you do not know of a machine, I should be greatly obliged, sir, if you or any of your staff would assist me by suggesting an improvement."

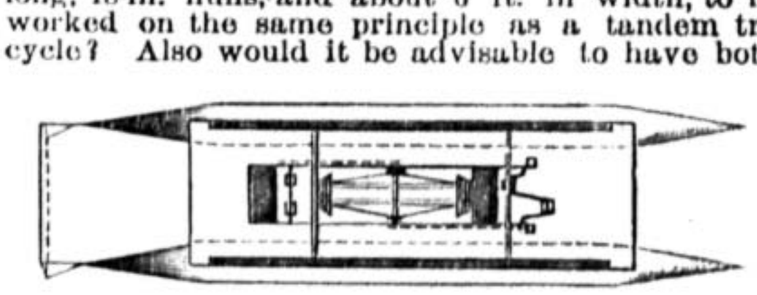
Printing Press, etc. — AMATEUR writes:—"Would any reader kindly furnish me with instructions for making a simple printing press, also the price of type (fancy and ordinary), and where it can be obtained?"



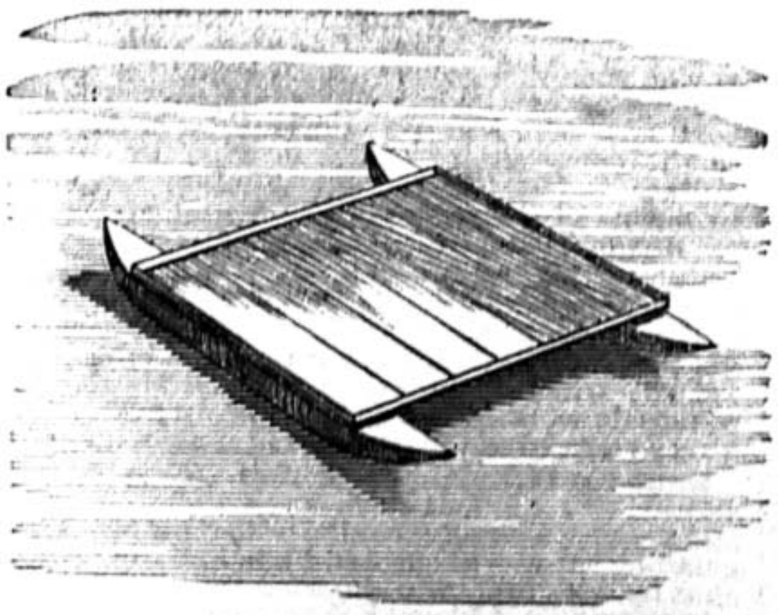
Cinder Sifter.

Cinder Sifter.—T. E. W. (*Hull*) writes:—"I should be very glad if some reader would be so kind as to tell me how I could make a cheap cinder sifter, something like the accompanying pattern, but not a very large size."

Water Cycle. — MOTIVE writes: — "Will anyone kindly give me sketch of a 'paddle wheel' suitable for propelling catamaran 17 ft. long, 18-in. hulls, and about 6 ft. in width, to be worked on the same principle as a tandem tricycle? Also would it be advisable to have both



Water Cycle, showing Principle of Propelling.



Sketch of Catamaran.

chains on one side, or one chain on either side of axle on paddle wheel, the objection to the latter being that one pulls against the other? Which would act the most satisfactorily?"

Vaporiser — Steamy Windows.—J. B. (*Colchester*) writes:—"Can anyone tell me how to prevent this terrible scourge where it is imperative to burn gas in winter?"

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Cheap Lathes.—P. B. H. (*Hendon*) writes, in reply to ENGINEER (see No. 88, page 586):—"I should advise ENGINEER to put on one side all idea of going to cheap makers of lathes. Cheap lathes are not much good for turning out good work; there are second-hand ones by good makers (Whitworth, Muir, etc.) that would do the work better. Why not get a second-hand one by a good maker, either through a machine broker or else look out for some sale of workshop appliances and attend and bid? You would find plenty of addresses in the Directory of a manufacturing town both of brokers and makers. The choice of town depends on where you live."

Gear Wheels.—P. B. H. (*Hendon*) writes, in reply to STOCKTON-ON-TEES (see No. 88, page 586):—"The most likely people I know to suit you are Messrs. Grimshaw & Baxter, 33 and 35, Goswell Road, London, E.C."

Gypsum.—J. M. (*No address*) writes, in reply to GYPSUM (see No. 88, page 586):—"You must have the flue on your kiln or oven in proportion to your fires; if your draught power is less than your fire power, why, then, material of any sort will blacken by the fumes and gases. Give your flue plenty of power; you can check with damper if too strong. Can GYPSUM, or any other reader of WORK, tell me how gypsum is used in glazes if mixed with other material? What are they, and proportions of each?"

Lathes.—M. (*Bishop Auckland*) writes, in reply to ENGINEER (see page 586, Vol. II.):—"You can purchase a lathe from the Britannia Company, Engineers, Colchester; they make lathes at all prices, and also supply second-hand ones; also from Mr. J. Reside, Engineer, Rastrick, Brighouse, Yorks; send a stamped envelope to either, and they will supply you with what you require."

Cabinet Fittings. H. F. S. (*Hammersmith*) writes, in reply to W. H. (*Hinckley*) (see page 602, Vol. II., No. 89):—"W. H. cannot do better than apply to Harger Brothers, Settle, Yorkshire, where he will obtain the stated requirements as cheap as any place I know of (see their illustrated catalogue)."

Gear Wheels.—M. (*Bishop Auckland*) writes, in reply to STOCKTON-ON-TEES (see page 586, Vol. II,):—"You can get cut gear wheels from the Britannia Company, Engineers, Colchester, or from Richard Lloyd & Co., 135, Steelhouse Lane, Birmingham."

Camera Fittings.—C. W. (*Stoke Newington*) writes, in reply to J. C. (*Glasgow*) (see page 602, Vol. II.):—"There is no one I can recommend so well as E. G. Platt, 'The Amateurs' Friend,' Birkbeck Works, Birkbeck Road, Ridley Road, Dalston, London, N.E.; he is the manufacturer. Send for his catalogue, post free. His price for half-plate rack and pinion is 5s. He supplies almost everything you would want."

Lathes.—W. J. W. (*Monkwearmouth*) writes, in reply to B. S. (*Edinburgh*) (see No. 89, page 602):—"If B. S. is an amateur, he will find Churchill's 'Eureka' lathe more suitable than the 'Barnes',' which is a heavier tool; but both are good value for the money, and cannot be beaten."

Camera Fittings.—W. J. W. (*Monkwearmouth*) writes, in reply to J. C. (*Glasgow*) (see No. 89, page 602):—"M'Ghie & Bolton, West Nile Street, Glasgow, supply the above at reasonable prices. Their price for half-plate rack and pinion is 6s. 8d."

Cabinet Fittings.—G. P. (*Elgin*) writes, in reply to W. H. (*Hinckley*) (see No. 89, page 602):—"I would advise W. H. to get the catalogue of either Henry Zilles, 24 and 26, Wilson Street, Finsbury, London, E.C.; Harger Brothers, Settle, Yorkshire; or J. H. Skinner & Co., East Dereham, Norfolk. Engravings of some very pretty and useful fittings are given in all their catalogues, and the price of each is also told."

Netting Needle.—T. H. (*Bridport*) writes, in reply to J. H. B. (*Pendleton*) (see page 551, Vol. II.):—"I beg to say that I am a maker of these machines for fishing nets."

Luminous Paint.—G. P. (*Elgin*) writes, in reply to INQUISITOR (see No. 89, page 602):—"I have seen luminous paint mentioned in the list of Theobald and Co., 7A, Bath Place, Kensington, London, W., but cannot remember the price. The list costs 1d."

Model Water Gauges. — ONE INTERESTED writes, in reply to YOUNG ENGINEER (see Vol. II., No. 68, page 261):—"I purchased a set of gauges giving every satisfaction, and perfect in every degree, and, if desirable, I can recommend you to the same place, from which you can purchase every description of brasswork (warranted) and at very reasonable prices. I may state that there are no more joints than in large gauges, and made exactly the same, taking a quarter glass, and the price was 7s. 6d. the set."

Lathe Attachment.—F. M. R. (*London, E.C.*) writes to H. C. D. (see page 583, Vol. II.):—"You will find full details of the above in Specification No. 15,365,189; this can be seen at the Patent Office library, or a copy obtained at the Sales' Room, Cursitor Street."

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—ABSTAINER; REFLECTOR; SPRINGY; J. H. B. (*Bristol*); CON-JUNGO; A. J. L. (*Paddington*); J. H. (*Leicester*); H. S. (*Wolverhampton*); S. H. (*Birmingham*); F. C. (*Bolton*); J. H. B. (*London, W.*); J. R. E. (*Manchester*); W. H. P. (*Hornsey*); G. L. S. (*Darlington*); F. B. (*Wakefield*); WATER LILY; E. R. (*Liverpool*); B. H. (*Birkenhead*); J. H. B. (*Bristol*); SLIEV DOUARD; MECHANIC; L. M. (*Lee*); J. P. (*Manchester*); CREWKERNE; REV. J. L. (*South Australia*); J. D. (*Glasgow*); AMATEUR; J. H.; ST. PETER'S BOY; M.; WESTWARD HO; S. H. (*Birmingham*); C. W. B. (*London, W.C.*); ELECTRIC; A READER; WOODPECKER; H. T. W. B. (*West Bromwich*); W. J. J. (*Southwick*); R. A. M.; F. C. (*Londonderry*); BRASS; W. K. (*Isle of Man*); W. G. (*Durham*); REGULAR READER; H. W. (*Tottenham*); J. G. B. (*Glasgow*); J. O. C. (*Rugby*).

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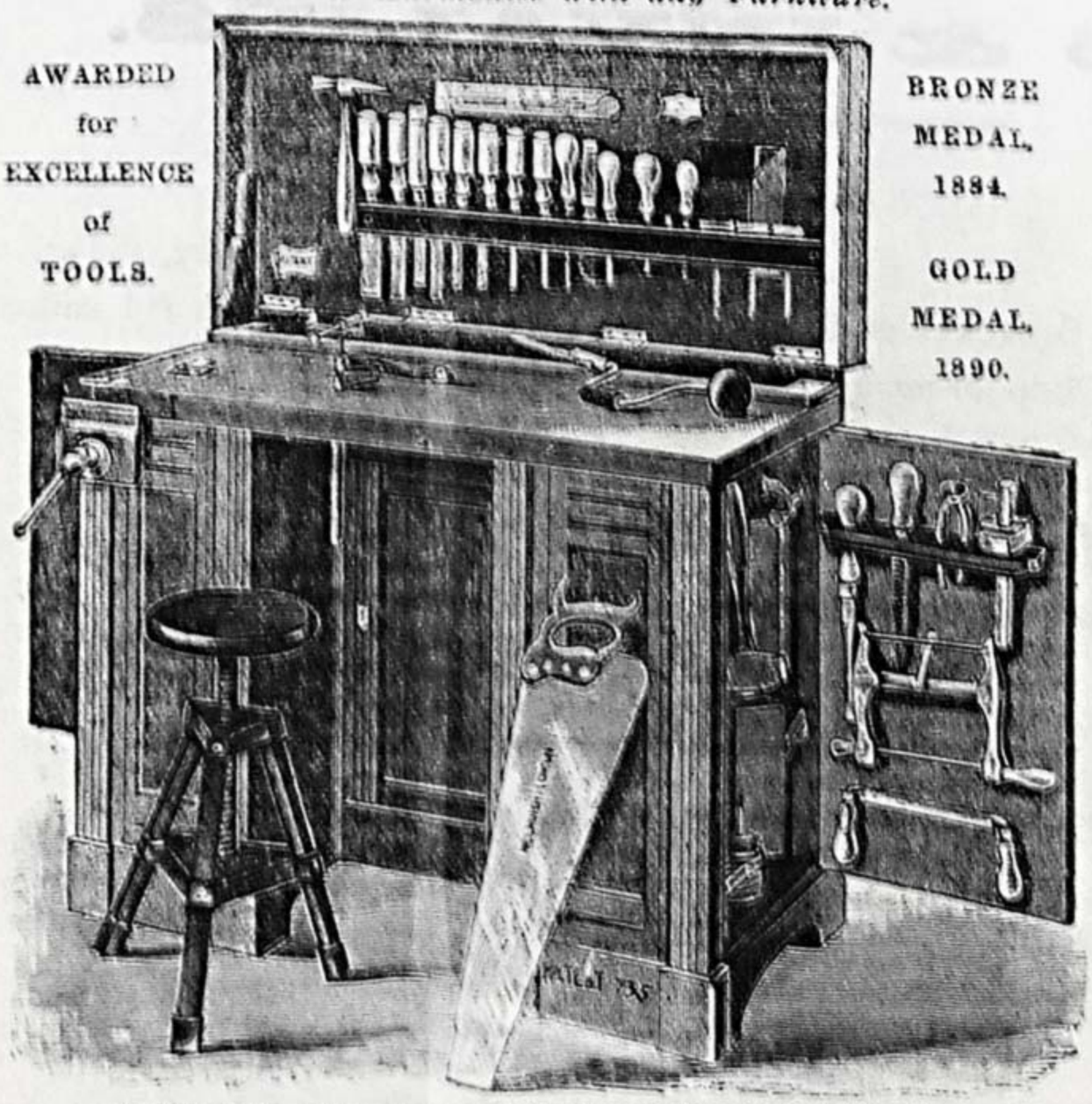

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